

**COOP'S  
SATELLITE  
DIGEST**



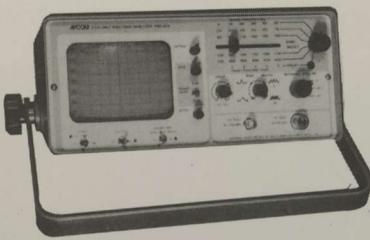
DECEMBER 15, 1986

INTERNATIONAL EDITION

# THE FIRST NAME IN SATELLITE EQUIPMENT

# AVCOM®

**NEW**



**PORTABLE SPECTRUM ANALYZER**  
**AVCOM's NEW AND IMPROVED PSA-35A**

AVCOM's new PSA-35A Portable Spectrum Analyzer features increased vertical sensitivity with front panel selection of either 2 dB/Div or 10 dB/Div operation. We have also made frequency selection more efficient with a new 1250 to 1750 band select position. The addition of these features produces a major increase in versatility with no increase in cost. The PSA-35A is lightweight, portable, and can be operated from its own internal, rechargeable, gel-cell batteries, or 110 Vac. The frequency coverage of the PSA-35A is from less than 10 to over 1750 MHz, and from 3.7 to 4.2 GHz in 6 bands (including current 12 GHz LNB's).

The new and improved AVCOM PSA-35A Portable Spectrum Analyzer is the most economical and cost effective answer to your satellite communication equipment installation problems. It will soon become indispensable for measuring and documenting system performance, accurate and rapid testing, alignment, and precise Terrestrial Interference identification.

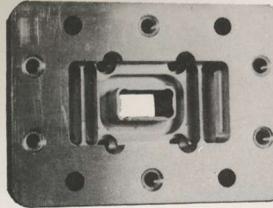
Installers of new or retrofit dual feed C/Ku band and single feed Ku band systems know that Ku band installations require extremely accurate dish tracking. If the dish is off only a fraction of a degree it can mean the difference between a terrible (or no) signal and an excellent one. Your PSA-35A is both C and Ku band compatible and is the perfect instrument for the critical dish alignment and tracking requirements necessary for maximum satellite signal reception. **\$1965**

**URLA-1450** — AVCOM's Uniform Response Line Amplifier is a carefully designed line amplifier having excellent frequency response over all block downconverter frequencies from 270 to 1450 MHz. **\$68.00**



**TISH-40 TERRESTRIAL INTERFERENCE SURVEY HORN** A highly directional, high gain horn for quick and accurate site surveys with the PSA-35 and any LNA. **\$127**

**NEW**



**CKA-12 MICROWAVE FLANGE ADAPTER** For C to Ku band waveguide the CKA-12 allows the use of larger C band waveguide components such as feedhorns, transitions, etc... with Ku band LNA's and LNC's. **\$87.00**

## INTERNATIONAL SATELLITE RECEIVER



**COM-66T RACK MOUNT INTERNATIONAL RECEIVER** Special options result in a block downconversion receiver offering the ultimate and specialized international satellite reception requirements. Triple IF filters are standard. **\$1189**

**NEW**

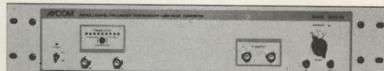


**MSG-5 MICROWAVE SWEEP GENERATOR** Digital LED readout to accurately determine frequency, sweeps 3.7 to 4.2 GHz to bandwidths less than one MHz at any center frequency between 3.7 and 4.2 GHz. **\$1087**

**MSG-1750 MICROWAVE SWEEP GENERATOR** Sweeps frequencies in the 950 to 1750 MHz Block Downconversion band, LED readout, can be used with PSA-35A to specify TI filters. **\$995**

**IFSG-70 MICROWAVE SWEEP GENERATOR** Sweep frequencies from 50 - 90 MHz frequency can be accurately read on a digital LED display. **\$932**

## SCPC HIGH STABILITY RECEIVERS



**SCPC-500 SINGLE CHANNEL PER CARRIER IF PROCESSOR** Block converts all signals on transponders 1 through 24 to an intermediate frequency of 50 to 550 MHz. An extremely stable microwave oscillator and phase locked loop virtually eliminate drift. **\$1245**



**SCPC-2000 SINGLE CHANNEL PER CARRIER RECEIVER** A complete, professional rack mounting 4 GHz input, baseband audio or data output receiver, the AVCOM SCPC-2000 is the most reliable and cost effective SCPC receiver on the market today. **\$1875**

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RICHMOND, VIRGINIA 23236  
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## TOP OF THE MONTH

**Oops.** After months of wrangling, hassle and half-truths, here it is all in one spot. The guts of Oak Orion's "cloning chip", and, more than you ever thought you would find describing Videocipher. The 'chips' will now fall, 'where they may'.

**SERVICE.** Readers say they want more practical dish install and service information. So we pulled Alli Lake off of several 'projects' long enough to pen some notes of practical value to dish installers.

**CABLE.** Several readers suggest we are out-of-bounds by encouraging people to build their own cable systems to get rich. Perhaps 'rich' is a misnomer and the series continues.

**LETTERS.** The mail volume increases weekly and we play catchup to pull even with the onslaught in an expanded 'Correspondence' section this month.

**GREEN SHEETS.** OK, 'one' of you has not yet bothered to use his or her 'free Green Sheets' ad yet. C'mon, off the dime and get those free ads in to us!

**COOP'S  
SATELLITE  
DIGEST**

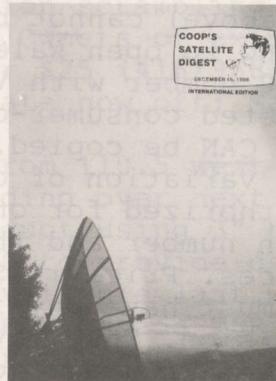


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110 D38D26BBD883000  
 118 00A0180004A01881  
 120 000000000000DC12  
 128 C8ABE57A4885000  
 130 02000083E92E2200  
 138 008600008C0C0B54  
**LOCATION: 6100-613F**

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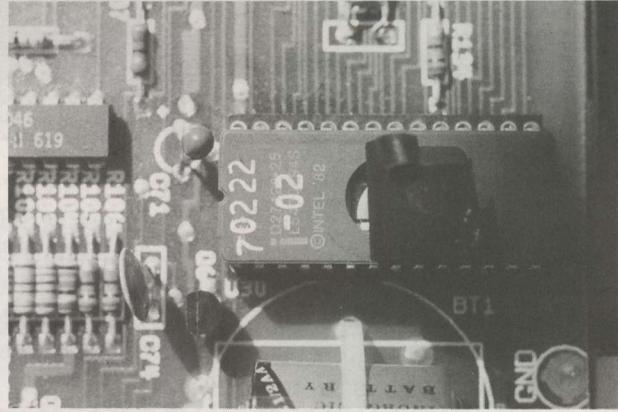


**OUR COVER/** Is there a pot of 'gold' at the end of the scrambling rainbow? Perhaps. Our emphasis this month is on the nitty-gritty of what is inside of both Orion and Videocipher scrambling systems. Photo by Bob Crean.

**COOP'S SATELLITE DIGEST** published on the 15th of each month, dated for the current month, by CSD, Limited, a Turks & Caicos corporation with corporate offices located at Tower Plaza, Providenciales, Turks & Caicos Islands, British West Indies. Under contract, an office is maintained in Fort Lauderdale, Fl. (P.O. Box 100858, Fort Lauderdale, Fl. 33310; 305/771-0505) for the contracted purpose of processing all subscriptions, advertising orders, receipt of all mail and correspondence. All communications relative to CSD operations should be directed to this office. CSD, Limited also maintains an equipment testing laboratory for satellite receiving systems and components in the Turks & Caicos Islands. CSD routinely reports on the technical performance of equipment, both privately and in print. CSD also participates in the operation of 'testtube' low power radio and television broadcasting stations and a rural area cable TV system as an ongoing research project into the challenge of bringing modern communication services to third-world, undeveloped regions. **CSD subscription rates** are \$60 for 12 issues where U.S. zip codes apply, \$65 in US funds in Canada and Mexico and \$75 in US funds elsewhere. All non-US copies are sent via AIRmail. CSD has been published each month since October of 1979 and publisher Bob Cooper created the home TVRO industry in 1978. Single copies are \$6 in US and \$7 elsewhere. Bob Cooper, Jr. is publisher, CSD is copyrighted by CSD, Limited in the Turks and Caicos Islands and USA. **Second Class postage paid** at Ft. Lauderdale, Fl. Application to mail at second class postage rates is pending at Ft. Lauderdale, Fl. Direct dial telephone to CSD, Limited is 809/946-4273 but be warned; this is an expensive telephone call!

**STOP-PRESS****Late News At Deadline**

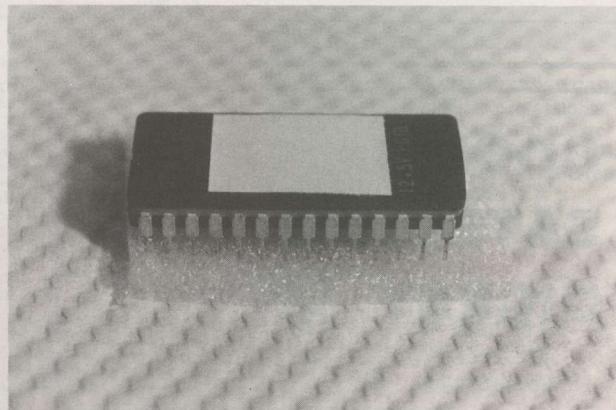
BATTLE ROYAL shaping up between creators/sellers of Musketeer chips. At least three versions (sources) exist in marketplace, not of equal sophistication. 'Western group' is selling through Canadian address (X-ACT, P.O. Box 1335, Spruce Grove, Alberta, Canada T7X 2W6; 403/486-2081) and plans to open Mexico and Caribbean outlets 'soon'. Buyer provides unit ID number and pays \$250 (single; \$200 in lots of five) for chips. System retains on screen text and graphics. Chip (see photo above) cannot be copied.



'Eastern Group' trying to open sales office in Nassau, Bahamas and hopes to use 800 number with VISA/Mastercharge cards. Their chip will be marketed consumer-direct in \$200 region. Unfortunately, their chip CAN be copied.

'Northern Group' has variation of clone plus Musketeer approach where master is authorized for one service and clones first share that authorization number and then are upgraded to receive all home directed services. Price is \$250 per 'conversion' but those doing conversion must have physical possession of VC2000 long enough to do conversion. They have limited their activity to outside of USA to date. They also claim their chip cannot be copied.

'Battle' is over philosophy attached to selling protected or unprotected chips. Western group fears sale of unprotected chips (see right for example) will result in 'cheap copies' coming to market ending \$200 range price quickly. Eastern group, not scheduled to begin shipments before January 1st and Western group hopes they will reconsider marketing plan before units go into distribution.



ONE unusual 'twist' to Western Group device is ability to read GI control telemetry stream via satellite as it is transmitted (see example, right) in real time.

LIKELY issue of protected/non-protected will not be resolved before DESCRAMBLING SUMMIT January 14-22 (see Coop's Comments, this issue).

PRIME-TIME-24 has identified three off-air network affiliate stations it plans to provide on F2R, TRs 3,11,23. They are WBBM (Chicago; CBS), WXIA (Atlanta; NBC) and WABC (NYC, ABC). Start up date 'early '87' but not firm. Videocipher will scramble.

CANCOM-2 level of Oak Orion scrambling has been defeated according to Canadian sources. Owners of existing Orion chips can have their chips updated for \$25 (416/968-3602).

ARIANE February launch date now off; March or April is more likely.

ANIK D2 is operational from 110.5 west and will be adding C and Ku band transponder loading over next few months.

UN-CIPHER, Canadian product using 3" by 3" circuit board claiming to wire into VC2000 to provide descrambling has list price of \$500, reportedly available last week of year (525 Seymour/Suite 212, Vancouver, BC, Canada V6B 387).

IRD receivers from Chaparral, Houston Tracker, Drake (et al) have unique software routines which are not compatible with any of the known Musketeer/Cloning descrambling approaches. While it is possible that adapted software could be written, belief now is that IRD units cannot be chip-broken for unauthorized service.

FESTIVAL/HBO/Cinemax feeds on RCA Ku-2 can be accessed by at least one version of Musketeer chips; mystery is why Festival, said to be a test with ten cable systems in US, is operating in key compatible with 'home' style VC2000 units.

LSI (large-scale-integrated) circuit boards for VC2000 next generation unit said to be under crash development. GI 'promises' no 'changes' in VC2000 IRD design prior to August '87 but sources suggest earlier attempt to upgrade to LSI units. When this happens, the chip solutions will not work with newer LSI units and present style, defeatable VC2000 units will have premium value because they are chip-solution-compatible.

0E0 F10000001000334F  
0E8 219D7FABD67A7700  
0F0 0000A01800D07805  
0F8 4B88000AAACEEA80  
100 A018165313080101  
108 000000100000BA4C  
110 D38D26BB08830000  
118 00A0180004A01881  
**LOCATION: 60E0-611F**

**COOP'S  
SATELLITE  
COMMENT**

- **VACATION Time**
- **UPDATE: Descrambler Busting Sales NOT So Good**

-Editorial Comment from Bob Cooper-

#### SCRAMBLE-Busting Summit

Just prior to Thanksgiving a small package arrived at our lab in the Turks and Caicos Islands via international courier. Inside was yet another chip type device with yet another bit of clever software burned into its innards. We plugged it into a socket inside of the VC2000 and turned on the Videocipher. Out of the video spigot of the VC2000 came perfect descrambled video on every transponder but 12 and 16 on GI. The Videocipher was brand new, out of a box, and unauthorized. From three different sources in ten days, we had three different 'software routines' that all essentially did the same thing.

At about the same time our telephone load down here in the islands had climbed upwards to 50 plus per day. We were actually turning the telephone off so we could conduct our regular island business and affairs. Locals were complaining that we never answered the telephone anymore. Patti and I missed three separate dinner party engagements in a week because we didn't answer the phone to receive our invitations. This was serious!

In the back recesses of my mind, I knew I had been through this before. But when, and where? Aah yes, I remembered. Back in the 1979, after I wrote and **TV Guide** published that first national article on the joys of owning a home dish, I had been flooded with hundreds, no - thousands of phone calls from people who wanted to know how they could have a 'dish thing'. We solved that one by creating the first **SPTS** (Satellite Private Terminal Seminar), in Oklahoma in August of 1979. Well, if we had been able to 'launch' the TVRO industry back in the 1979 by holding first one, and then another, seminar, why couldn't we help clear the air about the current mystery of scrambling by holding another seminar?

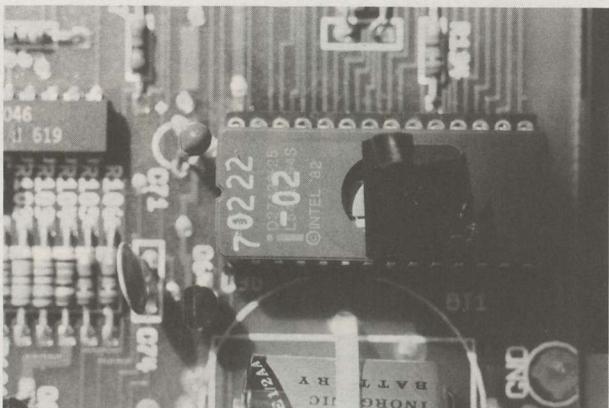
So we will. 'DS' or **Descrambling Summit** is scheduled for January 14-16, again from January 16-19 and again from January 19-22. We are holding it here on the island of Providenciales because the US 'law' concerning scrambling is pretty unclear and there is no point in trying to hold a seminar where we might get raided by some misguided federal marshal. Down here in the islands, we have no such marshals and no laws that prevent one from engaging in the **teaching of technology**. Down here he can sit in front of a group of people and openly display and talk about 'cloning chips'. 'Musketeer chips', Orion busting chips, 'back

door Blackcipher boxes', audio boards for the Black Boxes and anything else that is important. Down here a fellow who has chips to sell can lay them on a table, in the open, and offer them for sale. Down here a Videocipher unit can be torn apart wire by wire and pin by pin in front of a crowd without fear of retribution. So we'll do just that.

The laws seem to be saying that you cannot sell chips and stuff like that inside of the USA. The law does not say that a person who holds a US passport and who lives in (or out) of the USA can not **learn about** Videocipher busting techniques, although the law does 'seem' to say that if one tries to teach scramble busting techniques 'openly' **inside of** the USA, one might get shut down by a federal court order. The really old timers will remember that our very first satellite seminar, in Oklahoma back in 1979, was visited by a federal marshall who did try to shut us down. History repeats; we'll avoid history repeating by doing this in the open where there are no federal marshals.

I have invited (and will produce) some of the most knowledgeable people in scramble busting at our 'DS'. These are the underground people you have not heard of in CSD or in Scramble-Fax. They have been underground because they have feared that if they were out in the open, they would get squashed by the scrambling establishment inside of the states. We will also produce some learned legal opinions from qualified attorneys who believe they understand the laws in this area. We will produce people with briefcases filled with 'magic chips' who are at the **Scrambling Summit** because they will be looking for 'outlets' for their products. We will produce people with talents to create audio decoder boards and even full stand-alone Blackcipher descramblers.

The logistics of this is considerable. You have to get **yourself to Miami** at the appointed time and place to be met by a travel agency representative who will see that you get your seat on the correct airplane to Providenciales. We are running charters from Miami to Provo and return and you can come down January 14th and return on January 16th, come down on January 16th and return on January 19th, or take the 'Showend special' and come down on January 19th and return on January 22nd. If you are outside of the USA (and Canada) and you find it more convenient to fly in here direct from some other origination point than Miami, that's fine. Several dozen I have talked to are coming in from all



over the Caribbean and central America in private or privately-chartered airplanes.

**There will be room for no more than 100 per session.** Single and double occupancy rooms are available. You will have ground transportation from the airport and if you are assigned a room at a hotel other than the host hotel, you will be bussed back and forth as part of the package. All of your meals are included.

Each attendee will be given four chips to take back home with him or her. These will be functional chips capable of being inserted into a VC2000 to turn it on without authorization. I figure these four chips in today's market have a 'street value' of \$1,400.

Provo is delightful all year long but in January it is usually superb. The daytime temperatures will be in the mid 80s, the nighttime temps in the low 70s. Virtually everyone will stay right on the beach, less than 100 feet from the most perfect white sand and the most refreshingly warm Caribbean waters you have ever experienced.

The evening you arrive you will be immediately immersed in a working session. The next morning, after breakfast, you will start over and have a 2-1/2 hour session. We'll break for lunch and a swim (hey, there is nothing that precludes fun at a satellite conference!) and then hit the books and study tables for another couple of hours. That evening we'll do it again, after dinner. The last day you will have the opportunity to attend a 'descrambler market' where you will see and meet people who have products to sell. Then back to the airplane and back to the states.

You will notice there is no scheduled tour of our WIV facility in all of this. Frankly, we are not set up for tours and taking 300 people through there, even broken down as 100 per seminar session, would be very difficult.

Anyone who arrives in or brings a suit and tie will immediately be 'suspect'. Bring lightweight, 100% cotton, clothing and swimming attire. If you are an exhibitionist, you can forget the swimming attire since everyone at Club Med does that anyhow. Our restaurants are informal, our beaches are informal, and our people absolutely delightful. Leave any chips you may be carrying around on your shoulder at home; we have no time for such nonsense on Provo. Drug laws are strictly enforced, luggage is searched in and out

and weapons of any kind will land you in our antique clink.

**You will need proof of citizenship or a valid passport.** One handy, quick form of proving who you are and your citizenship is to carry a legible, certified copy of your birth certificate with you. You can bring all of the cash you wish with you; there are no restrictions. US currency is the legal tender despite our British heritage.

We will be shooting the seminar sessions proper on video and will provide a set of video and audio spigots at the rear of the room where you can daisy-chain yourself into a direct video (and audio) feed **if you bring your own VCR**. You can audio-record from your seat but no video cameras in the seminar sessions except for those we have in place.

**Spies.** Yeh, I suppose we'll have a few. GI would be insane not to try to get a couple of ringers down here. We are screening the names and have a technique worked out for spotting anyone who is an obvious spy (Doctor Mark Medress, for example, would stand out like a sore thumb). I figure it this way; since we are actually providing videotapes of the sessions and will be conducting open meetings anyhow, spies are inevitable. ('Open' means we will **restrict entry** to attendees but cannot possibly subject every attendee to an FBI security check in advance.) If I was dealing in these chip things (which I am not), and I was going to invest a bunch of bucks in chips, I'd want to know pretty darned quick if a particular chip or chip-approach was vulnerable to counter measure response from GI. So we might as well let them see how all of this works and to the top of the pile will move those techniques which are themselves invincible to counter measures. This will speed up the maturity of descrambling chips, sift out those that are poorly conceived and capable of being easily shut down. That's good for those who have to deal in this stuff because the bad ones will get wasted early and the good ones will survive and stand out above the crowd. So send your spies, GI. You'll pay the same price as everyone else, unless of course you want to sign up to conduct a seminar session for us! (In which case, we'll charge you double for the use of 'our hall').

I remember, fondly, the very first SPTS back in Oklahoma in 1979. It was truly the birth of an industry. The one-on-one people-to-people contacts made the experience impossible to ever forget and the business contacts started there have endured for all of the seven years that followed. I expect the same kind of freewheeling, one-on-one dialogues at the descrambling summit. By some strange coincidence the summit will be held almost one year to the day when HBO pushed the scrambling button. We'll hold a special 'memorial service' for that on January 17th for the seminar group that is here in the January 16-19 period. Perhaps we will include 'hanging an effigy' some notable foe of home dishes such as Michael Fuchs of HBO. Wouldn't that make great video for **Boresight**!

Oh yes; sorry for the 'short notice' but there were several excellent reasons for doing it this way. If you really plan to survive in the scrambled environment, and have finally come to the conclusion that you cannot survive by playing the game according to the rules set down by HBO/GI/etc, you will find a way to get to

Coop/ Continues on page 33

# **EVERYTHING THERE IS TO KNOW ABOUT SCRAMBLE-BUSTING TECHNIQUES**

**AND A CARIBBEAN SUN TAN AS A FREE BONUS!**

# DESCRAMBLING SUMMIT

- **THE BIG-BIG names** in scramble-busting technology, live at the seminar to teach you their expertise and answer your questions one-on-one (sorry; we cannot identify the 'teachers' prior to the seminar for security reasons).
- **You will learn** how Videocipher 'cloning', Videocipher 'Musketerring', Oak Orion 'Busting' works. You will be shown operational systems for video and audio.
- **You will receive** 4 operational chips as a part of your seminar package. These chips have a street value of \$1,400 and you will be taught how and why they work, and how to 'manage' these chips as a business investment as a dealer or distributor.
- **You are invited** to bring your own VCR to plug into a professional baseband video and audio service covering the full seminar. This will allow you to take home with you your own videotape 'record' of the seminar for later study.
- **You will learn** the truth about the weaknesses of clone and Musketeer chips, what the future holds in store for audio-boards created to add onto hardware products such as the 'Black Box Solution' as well as be exposed to the 'next level' of scramble-busting devices; completely independent Blackcipher boxes that function outside of the GI controlled authorization 'stream'.
- **If you are a dealer or distributor**, you will meet manufacturers and agents for descramble products with multiple opportunities to select a descrambler chip or service supplier.

**COME PREPARED TO WORK AND LEARN.** There are three separate sessions (January 14 to 16, January 16 to 19, January 19 to 22) and you will fly on your own to Miami where you will connect with a charter flight to an 'offshore location. One fee covers all of the following: (a) round-trip air fare from Miami to your destination and return to Miami; (b) hotel accommodations (single rooms but double occupancy is available); (c) all meals while at your 'destination'; (d) all ground transportation while at your destination; (e) four (4) descrambling chips with a 'street value' of \$1,400; (f) access for your VCR to a baseband video and audio feed to allow you to videotape the full seminar program. You must have either a valid passport or a 'certified' copy of your birth certificate (US citizens; others should ask for passport details when calling). Each session has room for only 100 people and special rules apply as to which session (January 14-16, 16-19 or 19-22) is available; details from the 800 number below. Your destination is the Island of **Providenciales** in the British West Indies, 85 minutes by jet charter from Miami. If you are coming from a US location, you may **not** bring a VC2000 with you because of US export regulations. If you are coming from a non-US destination and will not be a part of the US charter through Miami (ie. you are coming 'direct') special rules apply. Sources for chips and hardware will be on hand prepared to 'do business' and establish distribution relationships so be prepared yourself to 'do business'.

**THREE-DAY** intensive seminars designed to teach you the latest in Videocipher and Orion 'busting technology', **and**, to provide you with a **set** of Videocipher busting **chips** with a 'street value' of \$1,400.

**1-800-351-8261**

where 800 numbers apply; outside of those areas, 305/492-5522.

VISA, Mastercharge cards accepted. Hours are weekdays 9 AM to 6 PM eastern, Saturdays 9 AM to 2 PM.

## INSIDE OAK'S 2732 EPROM

As this is being written by a Canadian, we will be referring to all money in Canadian dollars (today US\$1.00 C\$1.40 approximately). Since August 1st, Cancom has been offering their Oak-P decoders for sale, where formerly they were only available on a rental basis. Now, Cancom says that this is because too many of their "subscribers" were giving false addresses and stealing the decoders. Or, is it just a coincidence that this decision on the part of Cancom just happened at the same time that "hot chips" for the Oak-P decoder became available? Cancom installed a new high speed computer recently, but in a recent test, about half of their authorized decoders were turned off during the two days they tried it. Supposedly about the same percentage of "hot chip" decoders were affected.

**Cancom** has thousands of decoders in their warehouses because some time ago when Oak Communications was in financial troubles, Cancom tried to give them financial support by purchasing all the available stock. The best industry estimates here give Cancom about two years to clear that stock, and only by selling (rather than renting) decoders, could they recover enough cash to even consider changing to another scrambling format. M/A-Com has given Cancom a quotation to supply a new encryption system, however it is hard to believe that a service that is barely breaking even could even consider such a move.

**One scenario** has been proposed that takes into the fact that a good number of the new TVRO receivers will have built in Videocipher II decoders

by Captain Borealis  
Someplace in Canada

Our author works for CANCOM (that will give then fits!). He does not wish to lose his job (hey, we all have to eat). He speaks with considerable knowledge of the true Cancom and Oak Orion situation, and unravels the mysteries of programming your own Oak-cloning-buster chip. Happy EPROMing.

rel byte	0 1	2 3	4 5	6 7	8 9	A B	C D	E F
000	7AB0	201E	B528	064B	2804	7720	1EB5	70B1
010	B4B6	B729	00C1	2804	7771	5A90	EF00	0000
020	636F	4C25	0094	F062	4C25	1894	EA63	6D4C
030	185E	8FFC	7250	616E	4C0B	6D4C	2355	5E8F
040	FB68	4DED	EDED	EDEC	5484	0991	0413	81FE
050	1394	1E76	5171	524E	5313	E353	1313	E353
060	15E3	8108	3294	0A4D	4CE4	5E31	94EA	9004
070	6870	5C30	94C2	2901	3600	0000	0000	0000
080	0000	0000	0000	0000	0000	0000	0000	0000
090	0000	0000	0000	0000	0000	0000	0000	0000
0A0	0BA1	5DA1	5D2B	A15D	2BA1	5D1B	A15D	A15D
0B0	4D5C	2B2B	2B2B	2B2B	2B2B	2B1A	2900	
0C0	D666	6872	5628	05C9	6768	7656	2805	C977
0D0	5628	05C6	4758	6D2F	20FF	5C63	5C70	B6A0
0E0	2220	BOA6	91FE	A681	FEA6	81FB	A681	F878
0F0	56C6	06C6	626E	5C63	705C	73B7	2019	5131
100	94FE	2B2B	2B2B	A021	DFB0	2220	B07B	B620
110	101B	2B2B	2B2B	2B2B	2B2B	2B2B	2B2B	
120	2B2B							
130	2B2B	1A29	0016	6D62	4C50	634E	E094	058F
140	F790	3CA0	21EF	B022	10B0	6268	70CC	8408
150	6370	CC84	0390	1962	4C63	EC25	0384	1425
160	1084	1025	1184	0C25	1484	0825	1584	0429
170	00D6	4C25	0084	086C	634C	625E	8FFB	4A21
180	0162	684C	5294	0921	1F25	0184	1A90	E170
190	676E	CE90	128F	FC62	684C	2120	9409	4A21
1A0	0894	0429	0262	6268	4D21	5F51	4D21	7F55
1B0	A021	DFB0	4125	1892	B713	2A01	C78E	1606
1C0	1607	4221	2045	0D01	6F01	F702	7F02	E602
1D0	F702	ED01	6F03	1303	5C03	B003	2103	2F01
1E0	6F01	6F01	6F03	FB04	1403	EE03	E404	
1F0	2904	3401	6F01	6F94	3850	4D21	7F51	4D21
200	7F52	4C21	7F53	676F	4C18	C01F	8103	181F
210	2501	9020	4A21	014A	9411	715A	7067	6E5E
220	8FFE	5C20	0656	6828	055A	4A21	DF5A	9033
230	2901	6F4A	2220	5A68	4DF1	900B	4DF2	9407
240	4DF3	9403	9018	4A22	405A	21C0	8415	4A21
250	2084	104A	2210	5AA0	21F7	B090	1B4A	21BF
260	90E8	4A21	EF5A	646F	2035	5E8F	FE28	0518
270	2805	10AO	2208	B04A	2201	21F7	5A90	B294
280	FD50	4D21	7F51	4D21	7F52	4C21	7F53	676B
290	4DFO	9408	4DF1	9407	4DF2	9403	4CF3	4A90
2A0	0521	7F90	A522	8090	A194	OB67	6F5C	5720
2B0	7656	2805	5790	C784	0B28	04D4	2804	B845
2C0	676F	5C90	F128	0482	2038	5028	04A4	90F4
2D0	2804	8220	3C50	2804	A44A	21F7	5A67	6876
2E0	5628	055A	90E9	9404	2805	1090	E284	FD28
2F0	04D4	2804	B890	0394	F34A	2104	9422	4A22
300	045A	7556	6668	2805	C972	5666	6828	055A
310	2903	B194	0B20	2050	2804	A448	2280	5890
320	CB94	FD28	048C	6F66	4C65	5E8F	FB90	1994
330	EF28	048C	6F66	4C65	5E8F	FB2A	06C0	7851
340	6668	165D	3194	FC28	0491	2806	606F	4C59
350	2805	186F	654C	665E	8FFB	90C4	2804	8228
360	048C	7056	6568	2805	C971	5666	6828	05C9
370	656F	70EE	8FFE	666F	EE8F	FE84	284A	2102
380	94D9	4A22	025A	7456	6568	2805	C971	5665
390	6828	055A	7356	6568	2805	C970	5665	6828
3A0	055A	90B8	2804	9128	0E57	6468	7556	2905
3B0	5A66	6872	5628	05C9	2902	7790	9E28	0482
3C0	2804	8C70	656F	5E8F	FE66	5E8F	FE28	04D4
3D0	6568	405D	415D	425C	90CB	8407	2804	D428
3E0	04B8	90D8	84FD	2804	D428	04B8	9003	94F3
3F0	4558	5720	0756	2805	5790	E894	E613	21E0
400	5049	1321	E0E0	2580	8407	25E0	8403	900A
410	20A0	9006	9412	1321	E050	4921	10E0	5048
420	210F	E050	2805	3890	BA94	FD13	5049	13E0

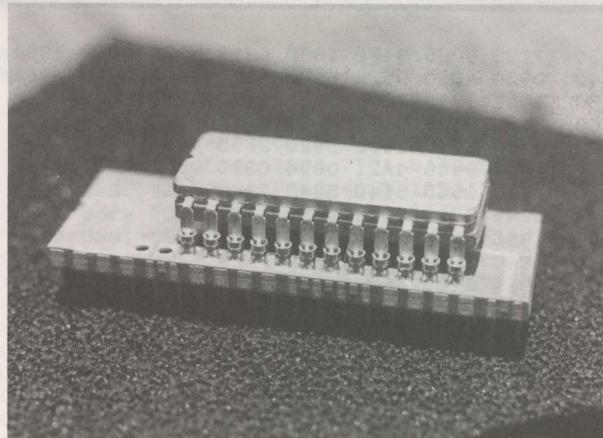
430 2120 90E6 94F2 1350 4913 E021 6025 6094  
 440 D920 A090 D52B 84E0 4156 2804 D428 04B8  
 450 4512 1212 2107 84D0 24FF 0B67 4521 0784  
 460 C750 7113 3094 FD12 5018 FC5C 4625 1694  
 470 044C E05C 2902 D920 3F50 400B 705C 3094  
 480 FA1C 9406 4A21 0894 0390 9D1C 70C8 81FA  
 490 1C62 694D 514D 524D 534C 646F 5E43 5E42  
 4A0 5E41 5C1C 4D52 4D53 4D54 400B 455D 425D  
 4B0 435D 8F02 1C44 5C1C 6A4D E094 104D E194  
 4C0 0C4C E294 084A 2208 21FB 5A1C 4A21 0884  
 4D0 B929 02D9 A022 8021 BFB0 A450 5408 2804  
 4E0 FFA0 2240 217F B0A4 5154 2804 FFA0 213F  
 4F0 B020 5EB5 A452 5428 04FF 0920 1EB5 1C44  
 500 5313 E353 1313 E353 15E3 8104 2900 001C  
 510 A021 FDB0 2202 B01C 4A21 1094 021C 646F  
 520 7750 4C13 125C 2101 51AO 1213 C1BO 70B4  
 530 4C30 94F1 4E8F EA1C 4A21 1094 021C 7851  
 540 40C0 5070 9202 1F52 A021 FAE2 B022 04B0  
 550 21FB B031 94EB 1C70 9002 7853 4625 0384  
 560 6325 0484 5F70 C384 034D 5747 0670 905C  
 570 02E7 217F 0257 843E 0828 0615 0970 5220  
 580 1CB5 2C20 0E51 2806 3878 5247 1212 2120  
 590 2202 B5B5 2C51 4713 5741 21FD B547 1232  
 5A0 94EC 7652 7251 2806 3809 7A51 2806 3809  
 5B0 092C 201E B533 9109 8407 4624 1056 90A6  
 5C0 1C90 AE29 0000 7190 0320 8754 0828 0615  
 5D0 0920 1CB5 B5B5 B520 1AB5 B5B5 B520 18B5  
 5E0 B571 5070 5157 7852 2012 B5B5 41F0 5147  
 5F0 13C1 5720 10B5 2BA5 5132 94ED 201E B541  
 600 F051 4713 C157 3484 0C92 B75D 8107 4624  
 610 1056 90B9 1C72 5046 141F 517A 5220 2631  
 620 9403 2006 B5B5 B5B5 21FD B532 94F0 4615  
 630 3094 E620 1EB5 B51C 41B5 B52C 3284 0921  
 640 FDB5 B5B5 2B90 F221 FDB5 1C20 4851 7050  
 650 3094 FE31 94FB 1C75 517F 5320 2857 9008  
 660 7051 2030 5777 5370 5018 5577 5420 2056  
 670 4A07 2A06 9B11 45F3 C70B 4C52 40F4 C60B  
 680 4DE2 217F 108E 1652 4CE2 5C40 1F50 3594  
 690 E631 81E3 035A 4821 7F58 1C3F 7937 7717  
 6A0 1426 2940 3B63 7E76 6C69 2C55 1013 0C4D  
 6B0 0504 4E0B 4A50 322D 0667 2E03 0A72 0102  
 6C0 592A 1171 1E47 7319 7C33 5A4F 616D 570E  
 6D0 751A 1C20 5D52 2F1D 783D 3164 095E 0F41  
 6E0 1B23 2451 4570 6E4B 582B 3916 3A48 3056  
 6F0 6825 5344 7B07 656A 1F0D 6674 2712 4C42  
 700 4908 6B3C 1822 7D00 546F 7A34 3E15 3858  
 710 7F5C 2860 3536 5F46 6221 4300 0000 0000  
 720 0000 0000 0000 0000 0000 0000 0000 0000  
 730 0000 0000 0000 0000 0000 0000 0000 0000  
 740 0000 0000 0000 0000 0000 0000 0000 0000  
 750 4D4B 452B 0000 0000 0000 0000 0000 0000  
 760 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 770 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 780 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 790 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 7A0 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 7B0 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 7C0 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 7D0 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 7E0 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 7F0 FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF  
 800 7AB0 201E B528 064B 2804 7720 1EB5 70B1  
 810 B4B6 B729 00C1 2804 7771 5A90 EF00 0000  
 820 636F 4C25 0094 F062 4C25 1894 EA63 6D4C  
 830 185E 8FFC 7250 616E 4C0B 6D4C 2355 5E8F  
 840 FB68 4DED EDED EDEC 5484 0991 0413 81FE  
 850 1394 1E76 5171 524E 5313 E353 1313 E353  
 860 15E3 8108 3294 0A4D 4CE4 5E31 94EA 9004  
 870 6870 5C30 94C2 2901 3600 0000 0000 0000  
 880 0000 0000 0000 0000 0000 0000 0000 0000  
 890 0000 0000 0000 0000 0000 0000 0000 0000

and also that there seems to be more Videocipher II decoders being activated in Canada than Oaks-P's. Cancom would then attempt to unload what stock they have by "whatever means necessary" in order to be able to finance the changeover to Videocipher II's. Supposedly this will make all the purchasers of decoders (that plan to install the "hot chip" sets) support the changeover costs, as well as make the Videocipher II available for all domestic Canadian and US services. The persons behind this scenario forgot that the Canadian government has spent millions of dollars forcing "Canadian content" on Canadians. By keeping two different standards of scrambling devices, one Canadian and the other American, the Canadian government would attempt to keep an **electronic border** in place. Then all they would have to do is declare the Videocipher II **illegal** in Canada! Sure some would get in, but probably not enough to make a major difference. Also, who are the major customers of Cancom? The cable companies, that's who! The best estimates are that cable companies and licensed community rebroadcast transmitters comprise better than 90% of the Cancom customers with the remainder being private TVRO systems. With people being basically honest, it is estimated that less than 1% of the official Cancom subscribers will cancel their service in orders to install "hot chips". Thus Cancom must ask themselves, their shareholders, and their bankers, whether it's worth spending many millions of dollars to save about 1% of their subscribers. The other users of the "hot chips" will be viewers that would never subscribe in the first place. Furthermore, the chief engineer of a major cable company that uses Cancom signals (with about 40 systems in small communities throughout western Canada) stated that it would cost their firm \$50,000.00 or more just to pay for the equipment alone, and about as much again to supply the labour to complete any changeover. Cancom would presumably then offer this value of "free" service to subsidize the changeover costs.

All told, it probably wouldn't be economically feasible for Cancom to change to any other scrambling format. However, they've been known to make wrong decisions in the past, so expect anything in the future. With the Oak system effectively dead, few programmers will opt for this encryption format. This leaves the Videocipher II as the strong force in the market, although it's only a matter of time before it's broken and readily available as well.

**Much** has been written in various trade and consumer magazine in the recent months about satellite scrambling and the various methods used to accomplish the scrambling. In fact **Radio-Electronics** has published a variety of methods on how to unscramble the scrambled signals,

8A0	OBA1	SDA1	SD2B	A15D	2B1A	5D1B	A15D	A15D
8B0	4D5C	2B2B	2B2B	2B2B	2B2B	2B2B	2B1A	2900
8C0	D666	6872	5628	05C9	6768	7656	2805	C977
8D0	5628	05C6	4758	626F	20FF	5C63	5C70	B6A0
8E0	2220	BOA6	91FE	A681	FEA6	81FB	A681	F878
8F0	56C6	06C6	626E	5C63	705C	73B7	2019	5131
900	94FE	2B2B	2B2B	A021	DFB0	2220	307B	3620
910	101B	2B2B						
920	2B2B							
930	2B2B	1A29	0016	6D62	4C50	634E	E094	058F
940	F790	3CA0	21EF	B022	1080	6268	70CC	8408
950	6370	CC84	0390	1962	4C63	EC25	0384	1425
960	1084	1025	1184	0C25	1484	0825	1584	0429
970	00D6	4C25	0084	086C	634C	625E	8FFB	4A21
980	0162	684C	5294	0921	1F25	0184	1A90	E170
990	676E	CE90	128F	FC62	684C	2120	9409	4A21
9A0	0894	0429	0262	6268	4D21	5F51	4D21	7F55
9B0	A021	DFB0	4125	1892	B713	2A01	C78E	1606
9C0	1607	4221	2045	0D01	6F01	F702	7F02	E602
9D0	F702	ED01	6F03	1303	5C03	B003	2103	ZF01
9E0	6F01	6F01	6F01	6F03	FB04	1403	EE03	E404
9F0	2904	3401	6F01	6F94	3850	4D21	7F51	4D21
A00	7F52	4C21	7F53	676F	4C18	C01F	8103	181F
A10	2501	9020	4A21	014A	9411	715A	7067	6E5E
A20	8FFE	5C20	0656	6828	055A	4A21	DF5A	9033
A30	2901	6F4A	2220	5A68	4DF1	900B	4DF2	9407
A40	4DF3	9403	9018	4A22	405A	21C0	8415	4A21
A50	2084	104A	2210	5AA0	21F7	B090	1B4A	21BF
A60	90E8	4A21	EF5A	646F	2035	5E8F	FE28	0518
A70	2805	10AO	2208	B04A	2201	21F7	5A90	B294
A80	FD50	4D21	7F51	4D21	7F52	4C21	7F53	676B
A90	4DFO	940B	4DF1	9407	4DF2	9403	4CF3	4A90
AA0	0521	7F90	A522	8090	A194	0B67	6F5C	5720
AB0	7656	2805	5790	C784	0B28	04D4	2804	8845
AC0	676F	5C90	F128	0482	2038	5028	04A4	90F4
AD0	2804	8220	3C50	2804	A44A	21F7	5A67	6876
AE0	5628	055A	90E9	9404	2805	1090	E284	FD28
AF0	04D4	2804	B890	0394	F34A	2104	9422	4A22
BO0	045A	7556	6668	2805	C972	5666	6828	055A
B10	2903	B194	0B20	2050	2804	A448	2280	5890
B20	CB94	FD28	048C	6F66	4C65	5E8F	FB90	1994
B30	EF28	048C	6F66	4C65	5E8F	FB2A	06C0	7851
B40	6668	165D	3194	FC28	0491	2806	606F	4C59
B50	2805	186F	654C	665E	8FFB	90C4	2804	8228
B60	048C	7056	6568	2805	C971	5666	6828	05C9
B70	656F	70EE	8FFE	666F	EE8F	FE84	284A	2102
B80	94D9	4A22	025A	7456	6568	2805	C971	5665
B90	6828	055A	7356	6568	2805	C970	5665	6828
BA0	055A	90BF	2804	9128	0657	6468	7556	2805
BB0	5A66	6872	5628	05C9	2902	7790	9E28	0482
BC0	2804	8C70	656F	5E8F	FE66	5E8F	FE28	04D4
BDO	6568	405D	415D	425C	90CB	8407	2804	D428
BE0	04B8	90D8	84FD	2804	D428	04B8	9003	94F3
BFO	4558	5720	0756	2805	5790	E894	E613	21E0
CO0	5049	1321	E0E0	2580	8407	25E0	8403	900A
C10	20A0	9006	9412	1321	E050	4921	10E0	5048
C20	210F	E050	2805	3890	BA94	FD13	5049	13E0
C30	2120	90E6	94F2	1350	4913	E021	6025	6094
C40	D920	A090	D52B	84E0	4156	2804	D428	04B8
C50	4512	1212	2107	84D0	24FF	0B67	4521	0784
C60	C750	7113	3094	FD12	5018	FC5C	4625	1694
C70	044C	E05C	2902	D920	3F50	400B	705C	3094
C80	FA1C	9406	4A21	0894	0390	9D1C	70C8	81FA
C90	1C62	694D	514D	524D	534C	646F	5E43	5E42
CA0	5E41	5C1C	4D52	4D53	4D54	400B	455D	425D
CBO	435D	8F02	1C44	5C1C	6A4D	E094	104D	E194
CC0	0C4C	E294	084A	2208	21FB	5A1C	4A21	0884
CDO	B292	02D9	A022	8021	BFB0	A450	5408	2804
CEO	FFAO	2240	217F	B0A4	5154	2804	FFAO	213F
CFO	B020	5EB5	A452	5428	04FF	0920	1EB5	1C44
DOO	5313	E353	1313	E353	15E3	8104	2900	001C



culminating in the October 1986 issue with a "How-to" article on the Telelease-Maast system.

We have also heard 'rumors' that someone has broken the Videocipher II and Oak systems. This article gives the detailed instructions to enable anyone with a little technical knowledge and access to an EPROM blaster to bypass the addressing system in the Oak-P(personal) decoder, thus allowing it to decode **any** Oak encrypted signal (as of this date). A fair warning - **DO NOT** attempt this unless you know what you are doing with CMOS devices **AND** remember the sale of any modified decoder is illegal!

You must disassemble the Oak-P decoder by removing the four hollow TORX screws holding the cover on. Firstly, check the three LSI chips to see if U22 is in a socket. If so, skip to the next paragraph; else remove the circuit board from the cabinet by removing the screws holding the circuit board to the chassis. Note that the screws holding the three voltage regulators to the side must also be removed and that the middle one (U17) has an insulator under it. Lay the circuit board with the three 40 pin LSI chips towards you. You will note that U20 and U21 are in sockets, however **U22 is not**. Using standard desoldering techniques carefully remove U22 from the circuit board and install a 40 pin IC socket in it's place. Now reassemble the decoder, leaving the cover off. Don't forget the insulator under U17!

The next step is to install a Mostek MK38P70 (part number MK97400/R-00) chip in place of U22 with the same orientation as the original chip. Now prepare a **2732 EPROM** to be placed in the holder on the Mostek MK38P70. Figures 1 through 5 show the coding to be put into the 2732 EPROM in standard hex format starting at relative byte 00 hex through relative byte FFF hex. After the EPROM is prepared, install it in the carrier on top of the Mostek MK38P70 and cover the unit up.

Connect the unit to the **unclamped** video source of your satellite receiver and tune in an Oak

D10 A021 FDB0 2202 B01C 4A21 1094 021C 646F  
 D20 7750 4C13 125C 2101 51AO 1213 C1B0 70B4  
 D30 4C30 94F1 4E8F EA1C 4A21 1094 021C 7851  
 D40 40C0 5070 9202 1F52 A021 FAE2 B022 04B0  
 D50 21FB B031 94EB 1C70 9002 7853 4625 0384  
 D60 6325 0484 5F70 C384 034D 5747 0670 905C  
 D70 02E7 217F 0257 843E 0828 0615 0970 5220  
 D80 1CB5 2C20 0E51 2806 3878 5247 1212 2120  
 D90 2202 B5B5 2C51 4713 5741 21FD B547 1232  
 DAO 94EC 7652 7251 2806 3809 7A51 2806 3809  
 DB0 092C 201E B533 9109 8407 4624 1056 90A6  
 DCO 1C90 AE29 0000 7190 0320 8754 0828 0615  
 DDO 0920 1CB5 B5B5 B520 1AB5 B5B5 B520 18B5  
 DE0 B571 5070 5157 7852 2012 B5B5 41F0 5147  
 DFO 13C1 5720 10B5 2B55 5132 94ED 201E B541  
 E00 F051 4713 C157 3484 0C92 B75D 8107 4624  
 E10 1056 90B9 1C72 5046 141F 517A 5220 2631  
 E20 9403 2006 B5B5 B5B5 21FD B532 94F0 4615  
 E30 3094 E620 1EB5 B51C 41B5 B52C 3284 0921  
 E40 FDB5 B5B5 2B90 F221 FDB5 1C20 4851 7050  
 E50 3094 FE31 94FB 1C75 517F 5320 2857 9008  
 E60 7051 2030 5777 5370 5018 5577 5420 2056  
 E70 4A07 2A06 9B11 45F3 C70B 4C52 40F4 C60B  
 E80 4DE2 217F 108E 1652 4CE2 5C40 1F50 3594  
 E90 E631 81E3 035A 4821 7F58 1C3F 7937 7717  
 EA0 1426 2940 3B63 7E76 6C69 2C55 1013 0C4D  
 EBO 0504 4E0B 4A50 322D 0667 2E03 0A72 0102  
 ECO 592A 1171 1E47 7319 7C33 5A4F 616D 570E  
 EDO 751A 1C20 5D52 2F1D 783D 3164 095E 0F41

EEO	1B23	2451	4570	6E4B	582B	3916	3A48	3056
EFO	6825	5344	7B07	656A	1F0D	6674	2712	4C42
FOO	4908	6B3C	1822	7D00	546F	7A34	3E15	385B
F10	7F5C	2860	3536	5F46	6221	4300	0000	0000
F20	0000	0000	0000	0000	0000	0000	0000	0000
F30	0000	0000	0000	0000	0000	0000	0000	0000
F40	0000	0000	0000	0000	0000	0000	0000	0000
F50	4D4B	452B	0000	0000	0000	0000	0000	0000
F60	FFFF							
F70	FFFF							
F80	FFFF							
F90	FFFF							
FA0	FFFF							
FBO	FFFF							
FC0	FFFF							
FDO	FFFF							
FE0	FFFF							
FF0	FFFF							

encrypted signal. Assuming all went well you should be getting unscrambled video within a minute or so and audio a couple of minutes later. The first time the decoder is turned on takes the longest to unscramble. Tests have shown that different chips seem to react at widely different speeds. Some take only a few seconds, where others can take a few minutes. Of course the stronger the signal, the faster the process takes.

## VIDEOCIPHER: INSIDE OF U7

### THE EXPORTATION PROBLEM

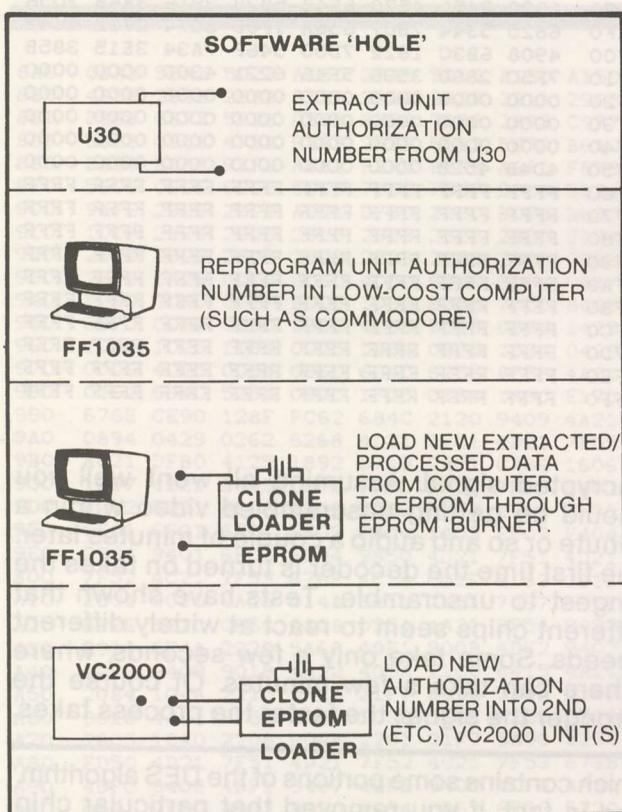
The DES 'algorithm' is said to be protected technology; something which the United States 'protects' from foreign (subversive) powers because the DES algorithm is used routinely by the US to encrypt or code various types of US non-classified (diplomatic and military) message traffic. The 'algorithm' is not totally present inside of the VC2000 decoder but segments of it are. Somehow, the original designers of the Videocipher claimed they were able to obtain placement on the 'export control list' for the Videocipher device. That appears to have been possible because of one chip in the VC2000

which contains some portions of the DES algorithm. And in fact, if you removed that particular chip from the VC2000, there would be no restrictions on the exportation of the VC2000 to anyplace on earth. Of course without the chip, the VC2000 does not function and you are still faced with the original problem: decoding of Videocipher encrypted signals from a location outside of the US (and Canada).

Much, perhaps too much, has been made of the exportation of this technology. M/A-Com, prior to turning the complete VC2000 package over to GI, notified possible exporters of satellite hardware that they were potentially in violation of US security laws when they participated in the exportation of VC2000 units. The M/A-Com communication, to distributors and dealers, even suggested that participating in such export activities might be considered 'an act of treason' by the US government.

We have attempted to pin down the real liability here since M/A-Com was not above exaggeration. We keep running into conflicting views and people within government who are unwilling to be directly quoted 'for the record' on this issue. The issue is important now that several different techniques are being sold offshore for defeating of Videocipher.

If the VC2000 REALLY is on a 'controlled technology list' (there is no hard proof it is so listed), then the 'War and National Defense' codes of the USA provide for fines of up to \$50,000 and a jail



term of not more than five years for the exportation of a VC2000. That's for openers (**section 2410, a)**). If the violation is determined to be 'willful', the fines can increase to \$250,000 and the jail term to as long as 10 years. If the offender is a corporation, as distinct from an individual, the fines grow to a maximum of \$1,000,000.

Furthermore, there are additional penalties for individuals who possess technology 'with the intent to export' or who 'give reason to believe that the technology would be exported' (**2410; (b) (3)**).

But is the VC2000 REALLY on a list of banned exports or is it merely another M/A-Com story? Proof is not easy to come by; queries to various US government agencies do not answer that question. And it **may** turn out to be a 'moot point' soon, anyhow since several sources insist that the special chip in question, now **possibly** protected by its DES algorithm guts, is about to come 'off the banned list' anyhow; as soon as January comes.

We all know:

- 1) That VC2000 units are being shipped into Canada, 'above board' or disguised as something else. And Canadians are buying the descramblers and having them authorized through the simple process of pretending they are located at US locations.
- 2) That VC2000 units are being hand carried or

shipped into Mexico, the Caribbean, and Latin America. And they, too, are being authorized at 'US addresses'.

- 3) That VC2000 units are being sold to and installed by hotels, condominiums, apartment complexes and even small cable systems inside of the United States, even though the units were never intended for 'commercial use' and warnings about using them for commercial installations appear all over the literature. (HBO was recently successful in prosecuting a pair of men in Utah who had sold VC2000 home-style units to **commercial** establishments in that state, posing as 'official representatives' of HBO.)

Let's trace what might happen with the two now commonly available Videocipher busting techniques.

- 1) **The cloned unit.** The individual VC2000 unit 'authorization key' is discovered and removed from the VC2000. This 'key' is electronically removed from the descrambler and stored in an external EPROM chip. The chip is then used in a procedure which allows a person to take that stored authorization number and use it to replace the original factory 'installed' authorization number, in a second unit. This process can be repeated, and repeated as many times as a user wishes. Each time this is done, the number of units in the field 'sharing' the identical number increases by one.

If ten units share the same number, and **one user** in this group subscribes to HBO, Cinemax, Showtime, The Movie Channel and CNN, **all of the units** sharing the same number will be simultaneously 'addressed' by the satellite fed data stream and all will turn on and receive the same services. Only one of the units is paying for these services, of course.

HBO warns people against this process, suggesting that when a unit is so 'modified', it will eventually be caught and service will be turned off. Before they bailed out of Videocipher units, M/A-Com was warning people that any modifications would invalidate the unit warranty.

**Units so modified have no external indication of modification.** All of the setup steps, all of the on-screen 'prompts' remain intact. Even a M/A-Com technician or engineer, given such a unit to inspect, would find nothing unusual about the unit. There is only one way they can tumble to the unit; if they have two or more with the exact same authorization number in their hands at the same time, they will see that when the unit is asked for its "ID" number, the number will be identical on both units.

A variation of this is now around. The 'cloning process' now modifies the on screen ID number so that it is not the real 'master unit' number. That means that when you push the setup sequence

on the display keyboard, you get an ID number that is fictitious. There are arguments going both ways.

A) "If the unit is ever accidentally returned to the factory for repair, the unit should have an operational ID number in it. The chances that two units with the same number will appear at the factory for repair simultaneously is slim. The factory will quickly see that the unit does not respond to its own on-screen ID number and that will lead them to the inside of the unit to discover why. Eventually they will deduce the unit has been 'cloned'. It is better to chance a unit getting to the factory with a false but working ID number than to send back a unit with a number that does not work at all."

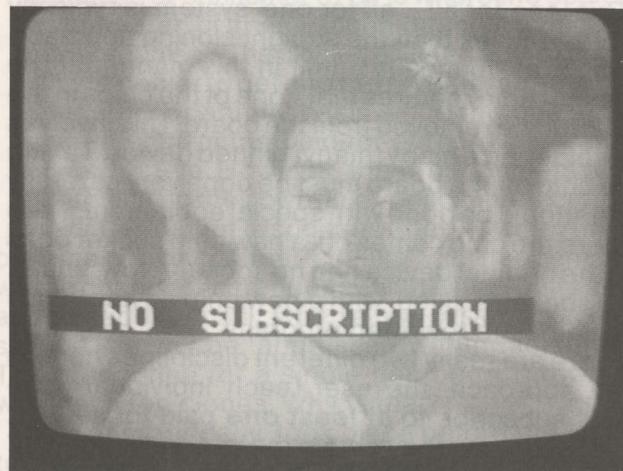
Or,

B) "If the unit gets back to the factory by mistake, you have to protect the rest of the 'cloned universe' sharing the same number. Suppose there are 24 such units. By exposing that unit to the factory, the other 24 in the same 'cloning cell' could be compromised if the factory decided to turn off that unit's authorization number. In theory, the factory believes every unit has a unique number. If one of a 25 unit cell was returned, the factory might turn off that number as a matter of course and assign a new number. Now the other 24 turn off and the service is cut off for the others as well. It is better to let them turn off a nonexistent number."

At the moment, neither school of thought is 'winning' and there are cloned units being distributed using both approaches. There is, however, another perhaps strong argument for retaining a real on-screen number even if the number is shared between several units. And that is **field verification**.

Part of the process invoked by the programmers is to provide them with a procedure which allows on-site, infield verification of descramblers. That works in this manner. Every descrambler has a 'US address'. That means a **physical address**, at some rural route box number or some street number. Post office boxes are not suitable. This allows a programmer to go into the field, to that address, to 'inspect' the descrambler. The inspection process includes physical viewing of the unit, a 'verification' that it is hooked up and working, and, by pushing the set up buttons on the unit, a cross-check of the unit's on screen ID number with the records. Is this the right unit, at the right location???

If a cloned unit had the wrong internal ID number, this would be discovered during such a field inspection. The internal ID number on the screen would not correspond with the unit's recorded number. At that point the field verification person is presented with a problem. He suspects the unit



is a clone, that no regular payment is being made for the unit. But the unit refuses to give out its 'correct' (as in operational) ID number. So it cannot be turned off by remote control because the real number cannot be determined. Can the programming haul the user into court because his on screen ID number does not match his recorded number? Perhaps.

Remember, however, that most if indeed not all of the cloning activity is taking place **outside of the USA**. And most of it is being kept to relatively small 'cells' of 25 units or less sharing the same number. Here the problem is slightly different; the 'master unit', the one from which all others were cloned, may not be in the USA. In this instance, if the programmer decides to inspect the unit's US address they find either no unit there at all, or they find a unit that does not properly match the recorded number. **What they cannot determine** is that while this unit may well be at the Georgia address where it is supposed to be, outside of the US there are 24 more units sharing the same number. If the inspection reveals the address to be false, the uplink can shut down the master (wherever it really is) and of course all of the cloned units sharing the same ID number will also shut down.

The trend at the moment is to retain the 'master unit' at a real US address in an operating situation. The cloned units are kept offshore and never the two paths shall cross.

**2) The Three Musketeers System.** The individual 'authorization key' is electronically removed from the unit. It is stored in a chip along with a program that has been written to transfer the authorization data stream intended to turn on 'one service' (such as CNN). Then the reworked software program is put back into the VC2000 (typically through the U30 chip). A unit so 'modified' can now receive **all** of the services,

provided it subscribes to at least **one** service. This 'one for all ... all for one' system is typically more complex than the straight cloning approach. First of all, to modify a unit in this manner at the present time requires that **one** of the chips in the VC2000 be removed from the board. This involves desoldering a many (many) pinned device. Taking the chip off the board must be done very carefully and should be done with special equipment. Then where the chip comes off, a new chip socket goes in (the original device had no socket). Now, finally, the socket is 'filled' with a new chip device which contains the rewritten program.

There are really two different disciplines here. In one approach, the user (each individual user) must subscribe to **at least one** paid-for service. This is the way they obtain the 'authorization key' to the unit and then in the software program that 'key' is reworked as a 'pointer' that causes the other (non-paid-for) services to also turn on. **Every user is still paying for something**; he (or she) is merely not paying for everything, although they are indeed receiving everything (including transponder 1 of GI, although usually not transponders 12 and 16 of GI).

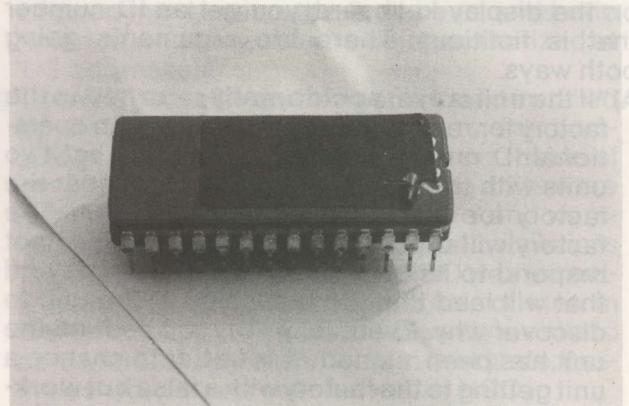
Another discipline takes a slightly different approach. The software program **includes** one paid for service, such as CNN. That means that when the new chip is inserted into the new socket, it comes with a built-in authorization 'pointer'. Someplace out there in the big Videocipher universe is **one box** that has paid for that **single service**. In this situation the modified units have a false on screen ID number because they do not wish to give away the real number that would tie the unit back to the original, authorized (for one service) VC2000. This is a 'hybrid' approach, a combination of the 'Three Musketeers' and 'cloning'.

A unit that has been modified with this system is very obvious; it has a 'missing' IC, replaced with a socket and a new IC. Some of these suppliers (actually operating inside of the US from the underground) are 'potting' the new chip with a tough material designed to keep 'amateurs' from getting inside. Others are 'potting' U7, U20 and U30, although only U30 is actually toyed-with, just to further 'confuse' the 'amateurs'.

## Security

The units following the 'Three Musketeers' approach to date are vulnerable, themselves, to copying. The U30 replacement chip can be copied with a modest amount of equipment, and once copied it can be duplicated an endless number of times. This has placed the creators of this system in some jeopardy since their 'secrets' are already available for others to decipher and copy.

Units following the pure cloning approach are



**EASTERN MUSKETEER** chip, a 27128 EPROM, is vulnerable to copying because its software is essentially unprotected. Chip is to be sold through Nassau, Bahamas '800 number' service.

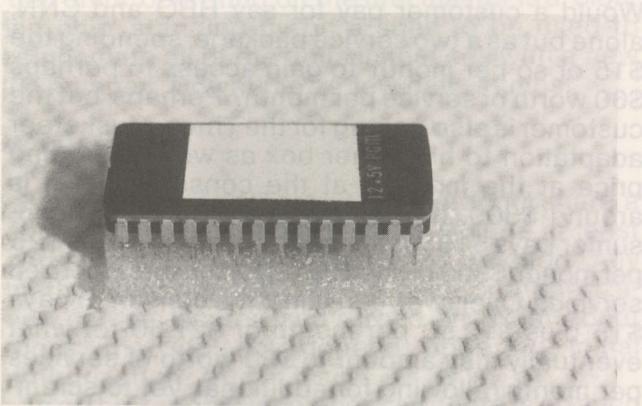
also vulnerable, but the technique is not. Someone obtaining a cloned unit could discover certain things from it, but not the original **technique** for extracting the 'master key(s)' from the original master unit. That means that to really profit from the cloning system, the copier has to have access to technology which is not shared nor available. The cloning technique is therefore described as the 'elegant approach' because as long as the system user disciplines his business to keep each cell fairly small (such as 25 units cloned from a single master before a new master is introduced), his 'exposure' remains quite small and even if a cell is 'lost' because of discovery, typically only one real unit is 'lost' (i.e. confiscated) and all other units in the cell can be recloned with a new master unit number(key) and put back into service in a few hours or days time.

Even if a programmer or GI were to get their hands on a 'clone-chip-master', they would have very little; true, they would see how the program was written and how the program was entered into a cloned unit. But the technique originally developed to **extract** the master key from the master unit would still not be evident.

## Other Techniques

Setting cloning or the "Three Musketeer" approaches aside, there are other developed systems for getting around Videocipher; they are not in 'general commerce' as of early December.

The cloning and tiered systems have a weakness; **they can be discovered** since at least one service is authorized (and paid for) and this subjects the unit(s) to the programmer verification process. Other techniques are more complicated, but they claim the ability to stand outside of both the satellite-authorization system and verification. Variations of this approach



**WESTERN MUSKETEER** chip has been 'copy protected' by moving some of its essential information out of the EPROM into another nearby chip. A simple 'clone copy' will not capture all of the required information for 'tiering' operation.

claim that the units have been 'field authorized' on all (or nearly all) Videocipher scrambled services. That means the satellite data stream is somehow subverted by the software rewritten into the unit.

One approach captures a data-stream-transmitted authorization command, they say, and 'adopts' that command as if it had originally been intended for the unit in question. This would allow such a unit to operate as long as the original-intended-for data stream fed unit was itself authorized. What happens if the original unit deauthorizes is unclear.

Another approach claims that the unit's software is rewritten to take advantage of the cable television VC2 authorization stream. The claim is that such units are 'moved' from the home 'family' to the 'professional family', and this transfer results in the unit's ability to function without the complicated data stream built into the system for the home units. How this benefits the clandestine home user is also not clear.

Still another approach claims it bypasses the authorization stream data totally, operating in a stand alone mode to authorize itself. In this situation, and to some extent in the two just preceding, if the unit is functional without being 'registered', then the 'dangers' involved with possible programmer field verification are avoided.

What is unclear in any of the techniques, except for cloning and 'tiering', is whether they work, reliably, or indeed at all.

Those who are working in this field to 'bust' the system are in something of a quandary.

- 1) If their technique is itself 'copyable' (i.e. tiering), the creators of the system have a worse security problem than GI and the programmers.
- 2) Any technique that relies on a 'paid-for-authorization-connection' runs the risk of discovery.

3) The revenue stream from consumer to programmer, or consumer to GI, is where the dealer or producer of these techniques is trying to position himself. The cloning or tiered approaches allow a dealer to get into the revenue stream on a monthly or annual basis since the dealer is able to control the paid-for-authorization end of the system. However, the programmers are tightening up their own field verification security.

One of the instant responses from GI, when they became convinced that 'cloning' was happening, was to change the frequency with which units are addressed. Normally, when a new customer orders service, he will be 'addressed' within moments. This works fine for a single unit but it throws a wrinkle in the clones. Why is that?

The cloning, ideally, took place before the master unit had ordered service. That means the cloned 'ID' is extracted and placed into the EPROM. That ID is then used to convert the secondary (to-be-cloned) units to the master ID number. There is no reason why this cannot be done after the master unit is authorized, but as a matter of marketing, it was typically done before the master was 'turned on'. If the to-be-turned on master is turned on by itself, there may not be a reauthorization for the same-ID-clones for as much as a month. That means the clones must all be up and operational at that instant when the master is turned on. Even in a 'cell' as small as 25 units, that can be a logistics problem. Why? Because every unit in the 'cell' has to be operating on the proper (such as HBO) transponder all at that moment of initial authorization.

**Cloners 'say' they can handle this;** that if the master unit is authorized prior to any extraction of its key number, they can also extract and clone the current month's satellite fed authorization as well. Whether that actually works that way is unproven as we write this report.

There is another suspected worry; verification of unit numbers. Some of the programmers now realize that to go into the field and 'visit' every unit out there to verify they are where they say they are can be a tremendous burden. It is said, certainly with no verification from HBO or other programmers, that the programmers will offer a '\$100 reward' to consumers who are able to produce a VC2000 which cannot match the on-record ID number. Here is the worry involved.

- 1) A consumer has purchased a VC2000, and has gone through the normal authorization process. They are on record and paying their bills.
- 2) They are 'offered' an opportunity to save money, to sign up with a 'new' cut-rate authorization service. It is, in fact, some sort of cloning service. The customer is not told what it really is.
- 3) On command, a message appears on the screen. The satellite fed data stream addresses that

unit and asks that unit what its 'factory assigned ID number' is. This is displayed on the screen.

- 4) The customer is then instructed to press the setup control sequence to check his own number. In theory, he might see **another** number appear (one entered by the cloning procedure).
- 5) If the two numbers do not 'match', the customer will be offered a reward (\$100 is mentioned) for turning him or herself in.

All of this seems like a fairy story. That the system might be capable of doing such a sequence is probable. That a customer, knowing he or she was participating in a cut-rate scheme to 'defraud' the programmers of programming bucks, would participate and cooperate, actually turning themselves in for \$100, is ludicrous. Still, it is this sort of 'conjecture' that is fueling new attempts to write 'patches' in the software around such scenarios. At least one cloning group has written the cloning software so that the unit retains its original ID number for on screen display even though it has a buried second ID or authorization number which is the 'real' operational ID number. Yet another group has disabled, in their cloning process, only one function; the ability of the unit to 'bring up' its internal authorization number. Every other on-screen text and prompt function remains intact; every other software routine still works (name of program, time remaining in program, et al).

### Sticking Up

Two types of authorized customers stand out in a computer analysis of VC2000 users:

- 1) Those who have subscribed for **just a single service** (such as CNN, but certainly not limited to CNN; it is chosen as an example because it is \$25 per year for three channels of service.);
- 2) Those who have subscribed to **everything** in sight.

Here are the concerns, and why.

Those who are marketing the 'Three Musketeer' package (one for all, all for one) recognize that if a significant number of users end up paying only for a single service (i.e. CNN), that these users who have properly identified themselves in order to get that one service will be 'flags' as potential mis-users. **Why** would several thousand or ten thousand people only sign up for **a single service**? That is suspicious and if a significant number of these are actually paying for one, but through chip-musketeering enjoying **all** of the services, the programmers will have a way to run them down, perhaps turn them off or even confiscate the units (and prosecute). The solution? **Pay for more than one service.**

But there is a point of diminishing returns here.

Would a customer pay for say HBO and CNN, alone but as a two service package, spending the \$15 or so per month, to gain access to perhaps \$60 worth of service per month? Perhaps, but the customer is **also paying** for the Three-Musketeer adaptation to his or her box as well. The going price at the moment at the consumer level is around \$300. In a single year's time, the consumer pays \$15 for the paid for services **and** \$25 per month (\$300 divided by 12) for the unauthorized services. Over two years time, the consumer pays \$15 plus \$12.50 per month or \$27.50 for what eventually may amount to \$90 worth of services per month (allowing for additional, yet to scramble services, also scrambling). Will it sell? Unknown of course.

The cloner has the opposite end of the problem. He is offering as large a subscription package as possible. He does this by taking his 'master unit' and getting it authorized for a bunch of services. Each of the units cloned from the master will also receive the same services. His marketplace attraction is that he offers **everything there is**; but that immediately moves the master unit up out of the ranks to the head of the class. How many people subscribe to absolutely everything available? Nobody knows but the GI control center for now. The assumption is that a very small percentage is paying the current \$60 or so per month to have **everything**. Now the programmers have a new flag to chase; a visit to each home where the consumer is paying for everything.

"Not a problem" suggests the cloners. "What they will see when they arrive is the **proper** unit, untampered with and **factory pure**. It will be in a home all by itself operating in a pristine, proper environment. What cannot be determined by operating or inspecting the unit is that it is indeed a 'master' and that someplace out there are 25 (or more) same-ID-units all sharing that unit's services.

Cloning, for now, is an 'offshore' market. **The master stays onshore, where it is available for inspection.** Even if a master is located, and inspected, it will not reveal that it is indeed a master. If after inspection the programming sleuths decide on their own (with no hard evidence) that it 'must be' a master, their only option short of getting the owner to admit he has a 'master' is to simply 'turn it off'. Does that shut the 'cell' down? Only temporarily.

**Cells are being set up with two masters** (and even more in some instances). One master is used for cloning the secondary units and the second master is 'put on the shelf, **also in the states**, as a backup. If by some quirk the original master is shut down, the second master is brought out (at a second address/location) and authorized in the normal manner. Already off shore, at the same location (i.e. island, or country) as the set of

'cell units' operating off the first master is a 'cloning chip' standing by on a shelf to be used to reinoculate all of the units in that cell with a new 'ID number'. Downtime? A few days at most.

### Weaknesses

Both cloning and 'Three-Musketeering' share a common problem; both systems require at least partial, paid-for authorization, to function. Any method that depends upon a paid-for-authorization can be located and turned off. What about those that do not depend upon an initial authorization???

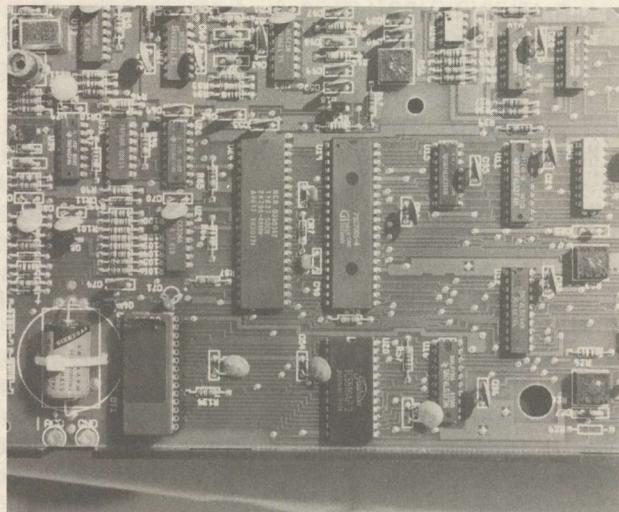
As of this report (December 1st), there is no such unit being marketed. That is not to say that a completely stand-alone package has not been created. **Some claim it has.**

Those who claim to deal in such technology are particularly sensitive about revealing either their full capabilities or their plans for marketing. There is good reason.

If a system was marketed which took the VC2000 out of the authorization stream, all records of it disappear at the time of sale. If it can function without being addressed through the satellite, then the GI authorization system is incapable of reaching it and instructing it. That means that any instructions now understood, in the GI authorization software, would be ineffective against such units. They could stand outside of the system (indeed, outside of the USA) and wag their thumb and little finger at the system itself.

Furthermore, if a VC2000 can be modified through software routine change or software plus hardware change to be 'free of GI authorization control', the next step is to create a stand-alone descrambler which duplicates all of the **required** functions. In other words, a 'competitive source' for the VC2. That is the goal of several groups; to not only be free of the authorization family, but to be free of the GI VC2000 unit as well. Is that practical?

Again, those who are working in this area claim it is; **we have seen no complete VC2000 replacement box to date** but at least three groups claim to have working prototypes. At least one group has created an audio-only set of circuits (on their own circuit board) which they intend to market to those people who have purchased the 'Black Box' kit from the marketplace. The Black Box (Solution) is a video-only system that corrects Videocipher **video**, but makes no claims for the audio. The people behind this product have sold it with no apparent M/A-Com(GI) 'legal' problems to date. It is believed they have been left alone to do their thing in the marketplace because they have not breached the audio portion, and M/A-Com never made any real claims for the video security



in the first place.

**Boresight**, alone, has sold several thousand 'parts kits' for the Black Box (Solution). In theory, each of those video-only buyers is a candidate for the audio add-on circuitry as well.

But there is a larger market. A much larger market. If GI has now authorized around 60,000 home users for the VC2000, through the master authorization center, that leaves 1 3/4 million home systems still unserved with scrambled programming. In theory, these systems have cost their owners on-the-average \$3,000 each, spread over nearly seven years of TVRO sales. How much more money would the 1-3/4 million existing dish owners be willing to spend to gain back access to **all** of the cable scrambled programming? A one time purchase; perhaps \$500 each, **perhaps more**.

The VC2000, if cloned or 'musketeered', is traceable. A VC2000 bought but never authorized is not today **as traceable**, but if there was an upsurge in VC2000 **sales** and a flattening off of VC2000 **authorizations**, the VC2000 distributors would certainly tighten up the distribution process. And that brings the sellers of VC2000-competitive units, built outside of the normal GI (and Channel Master) production facilities to the surface. How far away is all of this?

**"We are not less than ninety days, not more than 180 days from delivery in quantity"** reports one would be designer and seller. Digging further, we discover there are two practical problems remaining.

**1) Software bugs.** Cloning merely changes an ID number; tiering ('Muskeeteering') moves an authorization from one (paid for) service to another unpaid for service. Starting fresh requires that the software either 'ignore' the data stream entirely but somehow still magically decode, or, that it captures ('randomly') from the satellite data stream an authorization 'key'

(number). In the latter example, the descrambler is 'borrowing' some other units key(s) which it detects and stores from the incoming satellite data stream.

**2) Tooling up.** The parts count, even in a start-from-scratch Videocipher type of unit is significant. Some of the parts are only available from a single source and that leaves a 'trail' of who is buying such parts. It is not quite like tooling up for a satellite receiver where parts are common, and available in depth at distributors all across the country.

It is possible that we will **never see** stand alone descramblers which cannot be traced through the GI/Channel Master distribution system; that the 'dream' of having an independent source available is unrealistic. It is, in all honesty, too soon to tell.

### Practical Problems

Cloning involves no physical changes to a VC2000. A unit, the master, has its key extracted and that extraction process leaves no 'trail' of any kind. The secondary units, the clones, are 'inoculated' with the EPROM 'loading chip' without any physical modifications to the cloned unit. Not even the designer could tell from an exterior inspection that he had a cloned unit in his hands.

'Musketeing' does involve some **physical** changes. The U30 chip is actually replaced with a new chip. The U30 chip is soldered to the circuit board as the unit comes from GI. The original U30 chip must be removed from the circuit board. This is not a task for a rank amateur since damage to the circuit board can happen quite easily.

Properly, special tools are employed to desolder the U30 chip. These tools distribute the heat to each of the pin locations (each of the pins, there are 28 in all, must be unsoldered, ideally all at the same instant to allow the chip to be pulled from the board). If the U30 chip is 'wasted' in the process, it is not a big deal; you will not use it again.

In theory, the new ('Musketeer') chip **could be** soldered back in place. There is a risk to that. In the event that a 'Musketeer' unit is discovered and turned off, the owner of **that unit** would be faced with either trashing the unit or getting it reactivated. By changing the U30 chip (a second time), he could then 'start over' with a new 'authorization sequence'. There is another reason to gain the ability to **plug-in** U30 chips. Perhaps, just perhaps, GI has not trotted out all of its 'heavy' artillery yet. There may be a 'software routine' held in reserve which would close up the present 'Musketeer' patch that gets inside the authorization stream.

"We will rework our patch program to com-



pensate for any changes they can make in their downloaded software" promises a Musketeer seller. "We believe we are capable of adapting to any changes they can write into the software. But that would require that we be able to exchange a new chip with the first chip we supplied (for U30). We think a socket in the U30 position is therefore important".

Since several of the techniques now on the market do involve U30, and the physical changing of the chip, the act of adapting the circuit board for a socket in the U30 position takes on an interesting business form.

"We can find no legal reason why we cannot openly conduct business to remove U30 from the circuit board, replace it with a socket, and then reinsert the original U30 device back into the socket" suggests a would be operator who envisions a \$50 charge for reworking the circuit board. GI, of course, is expected to respond by warning consumers that if they allow someone to add a socket in the U30 position, even if the original U30 chip is put back (into the socket), the GI (i.e. original M/A-Com) warranty is 'void'. And that may deter some consumers from allowing U30 to be modified with a socket.

Why anyone would want U30 mounted in a socket, rather than hard-wired onto the circuit board, **unless** they planned to later replace the original (factory) U30 device with a new 'Musketeer' device is a 'cute question'. It is important to keep in mind, however, that both the cloning and the 'Musketeer' approaches do focus on U30 although the cloning approaches shown to date accomplish this without physical change of the U30 chip.

### SUMMARY

There are daily changes in the descrambler battlefield marketplace. Some of these changes are significant; most are not. True breakthroughs are

rare and now both cloning and Musketeer chips are moving in commerce, the next likely step in this scenario will happen when GI gets their hands on enough of both chips to decipher how they have been software modified. At that point, we can expect changes in the data stream software. Many early users run the risk that they will lose service when this happens since few students of this game believe that any of the present clone or Musketeer techniques are themselves invincible to the next level of software change originating at the authorization center uplink in San Diego.

Cloning chips can be recloned (i.e. copied again) as can Musketeer chips. Cloning sellers do not hand a cloning master to a dealer/customer. They must bring the units to be cloned to an (off-shore) center where the inoculation process takes place. This is important since the master cloning chip-on-a-clip can be used endlessly (over and over again) and the marketeers, to avoid detection, are self-policing clone-cells to around 25 units cloned for each master unit.

**Musketeer chips can also be copied;** the 'blank' EPROM sells on the open market in quantities of 100 or so for under \$4 each. After it has

been programmed, it sells for typically \$200 dealer cost and \$300 consumer cost. That is an attractive 'mark-up' for copying of Musketeer chips. And it may already be happening.

There is even a war of sorts shaping up between those who would sell cloning and those who would sell 'Musketeer' chips. One clone seller feels the Musketeer chip is a 'big mistake' since it allows, even invites 'unauthorized' copying.

"I am tempted to make up 2,000 chips using the Musketeer approach and mail them out, with instructions, to 2,000 dish dealers. I wouldn't charge for this and I wouldn't even identify who sent them. This would accomplish two things; it would end the 'Musketeer' viability in the marketplace because once released in this fashion, those 2,000 chips would turn into 20,000 or 200,000 in a month's time. Given the real cost (under \$4 for the blank chip), I can see these devices ending up to the consumer for perhaps \$50; the price of adding a socket to the circuit board. And second, while GI is out pouring water on that fire, we'd be busy making the clone sell as the more secure system that will win this war."

## BE A CABLE OPERATOR: #5

### BARGAINS In Cable Plants

In our series to date we looked at the potential money that a person or group of people can make by being in the cable television business. We have seen that the basic cable system lives by working towards separate revenue stream goals:

- 1) Monthly subscription income for 'basic' cable
- 2) Monthly subscription income for 'premium' cable
- 3) And, the big payoff; the per-subscriber valuation of the cable system if and when it is eventually sold.

We have also seen (CSD November 1986) that while small cable systems of just a few hundred subscribers may be very difficult to sustain in

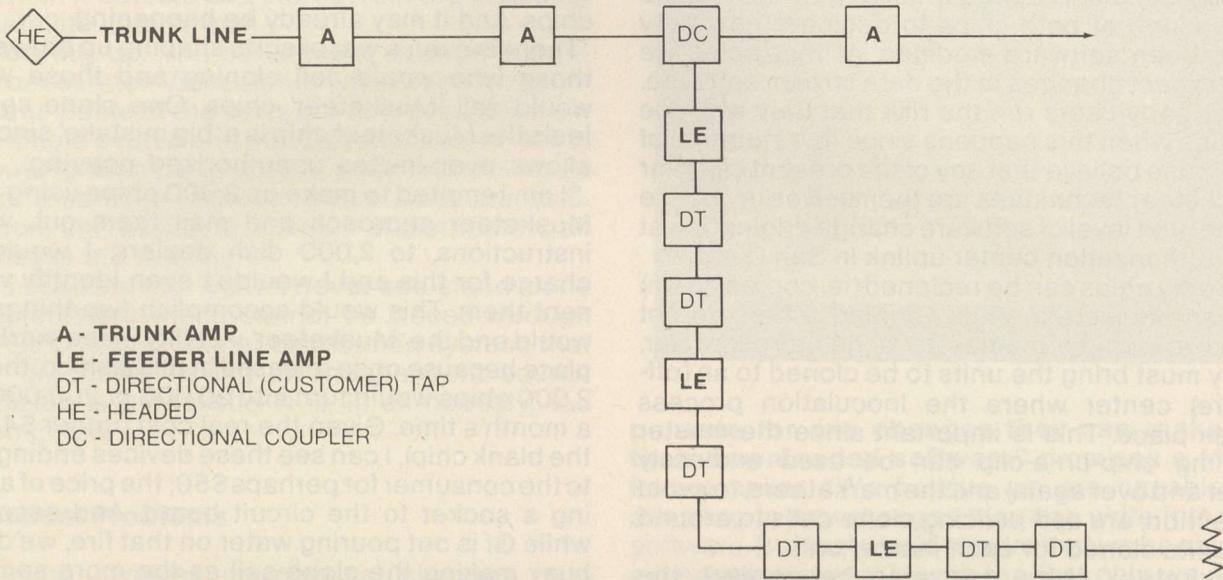
their early years, if they are fundamentally sound in time they will return good revenues to the builder.

Ideally, you would build a cable system for \$00 per cable mile and avoid all of the negative cash flow problems explained in our November report. At the opposite end of the scale, a system that might be capable of making its own bank payments over a five year payout, at \$5,000 per cable mile capital cost, suddenly becomes impossible at \$6,000 per cable mile. Since every system has an initial capital cost to be paid off from 'cash flow' it follows that careful planning (preliminary) attention to how your cable system will go together (i.e. for the least bucks possible, per mile) will have a dramatic (and long term) effect on your ability to pay the system off. So how does one build a 'cheap' cable system? That is a challenge which has eluded complete solution for more than thirty years. We'll see why.

### TRUNK

Within a cable system 'plant' we have three different categories of cable;

- 1) **Trunk cable**/the "mainline" cable which is used to carry the cable channels from the originating point ('headend') to the ends of the community.
- 2) **Feeder cable**/the 'secondary' line cable which is used to 'bridge' between the trunk and the customer connection boxes (i.e. directional taps).



DIRECTIONAL TAPS (DT) are NEVER installed on trunk lines. Customers are served from feeder lines 'isolated' from trunk lines with or by directional couplers (DC) or some other high isolation device.

**3) Drop cable**/the smaller sized (RG-6/U or RG-59/U) cable which connects each individual subscriber to the system proper, at the feeder cable customer tap-off device (directional tap).

One of the cardinal rules about a 'trunk cable' is that you never(NEVER!) connect a subscriber to a trunk cable. There are several good reasons why this is the case.

**First of all**, each and every subscriber device (directional tap) placed into the cable line causes an 'imbalance' in the line. In other words, the customer 'tap off' device is not perfect and there is degradation of the quality (and levels) of signal on the line when a tap-off device is inserted into the line. The theory behind the 'trunk' is that you install as few 'imbalancing devices' as possible in the trunk line to insure that the quality of the signal(s) on the trunk line(s) stay as high as possible.

**Secondly**, no matter how good the design of the customer tap-off (directional tap) device, there are conditions or situations where an 'accident' on the customer service line (i.e. at the customer end of the drop line) can screw up the service for other plugged into the same street side line. If you had this happen on your trunk line, and the accident occurred in the middle of the cable plant, every home following the tap-off where the accident occurred would have degraded reception (or none at all).

**Thirdly**, because every tap-off unit introduces measurable amounts of signal loss (this happens because the tap-off device actually takes signal

out of the line to send to the subscriber), and in most systems you are adding new tap-off devices fairly routinely to serve new customers in homes or places where no service was required (as the system was built), if you are 'tapping the trunk' you end up reducing the trunk line levels every time you add a new directional tap to serve a new customer. The trunk line system is intended to be 'stable' in signal level(s) from day one to day end; you plan it so that you **always** have the proper signal levels on that line, to insure that at the ends of the system you do not run out of signal. If you reduce those signal levels each time you add a new tap to serve an unexpected customer, you are defeating the original intent of the trunk line.

**Fourthly**, each time you have to add a new tap-off device you must cut the primary (tap-off feeding) cable in two and physically insert the new tap-off device. This causes a disruption in service for all points beyond the 'cut'. If you do this on a trunk, you will cut off service for everything past that point. And since the cable also carries AC power to run the amplifiers along with the TV signals, you also run the risk that in cutting the cable to install the tap, you will short the power and possibly damage mainline power supplies.

So it is not wise, except under very unusual circumstances involving very small cable plants to 'tap the trunk'.

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CABLE/ continues from page 20

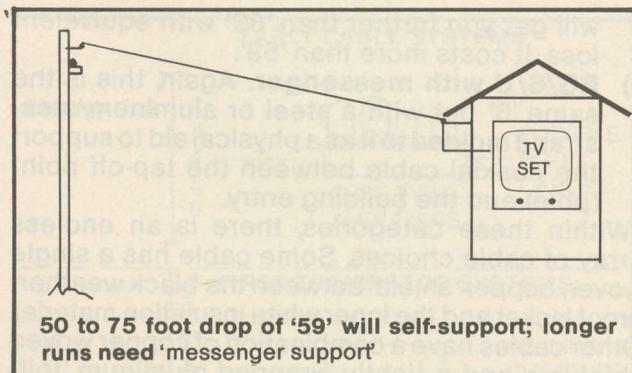
### FEEDER

If you cannot wisely 'tap the trunk', what do you 'tap'? Something called the feeder cable. The concept behind the feeder is as follows:

**A)** All of the signals, strong and pure, are in the trunk. The trunk line will often travel some distance through countryside where there are no homes to serve. In other words, the trunk is 'transporting' signals through such an area, not 'delivering' service to subscribers. When the trunk approaches an area where there are homes to serve, we need to get the signals out of the trunk and into a secondary 'feeder cable line'. There are several ways to do this as we shall see. Once we have the signals split off from the trunk, now we carry them in front of the potential subscriber homes in our 'feeder' or 'secondary' cable. The feeder line is electrically 'isolated' from the trunk line by special devices we have selected for this purpose. Now we can install customer tap-off devices into the feeder line(s) and serve those homes without fear of disrupting customers served beyond that point by the ongoing trunk cable.

The feeder cable runs are typically quite short in length. They connect to the trunk through high quality directional couplers, through high quality line splitters, or through something called bridging amplifiers. The trunk cable is usually larger diameter cable than the feeder line cables. Remember that the larger the physical diameter of the solid aluminum jacketed cable, the lower the loss for the cable. Ideally we would use cable so large that it had virtually no loss. There is a point of diminishing returns, however, because as cable diameter increases the physical problems associated with handling and installing or maintaining such large diameter cables increases rapidly. Most trunk cables are .500 (1/2 inch), .750 (3/4 inch) or 1.000 (1 inch) in diameter. Most feeder cables are .412 (approximately 4/10ths inch) or .500 (1/2 inch) in diameter. For cable plants of relatively small size (i.e. those we are concerned with in this series), a 3/4 inch trunk cable would be maximum and in most instances 1/2 inch trunk is fine. And the feeder cables will be .412.

There is a dollar balancing act going on here. Larger cable costs more, per foot, than smaller cable. Smaller cable has more loss than larger cable and the way you make up for loss is to use amplifiers. If you select a smaller cable (.412 for example) you may save five cents per foot over slightly larger cable (.500); but, in the selection, you have just increased the total number of line amplifiers required to build the system. So which will cost more; larger cable, or, more amplifiers? We'll come back to that point as the answer is not



quite as simple as it may seem on the surface.

For reasons we will explore in this series, in your typical cable plant design there are seldom more than 3 feeder line amplifiers (called 'line extenders') placed on a feeder line, after the feeder line is 'split' out of the trunk line. That's because the 'technical quality' of the line extender amplifiers is, for dollar reasons, not as good as the technical quality of the trunk amplifiers. We'll see why.

Feeder lines may go up and down streets or alleyways all by themselves (i.e. in areas where there is no trunk cable), or, they may go on the same pole(s) as the trunk lines. In the latter case, you end up with two (or in some situations three or more) 'cable TV lines' all bundled together on the same pole(s). This brings up some mechanical considerations; each cable has 'weight' and it exerts some amount of pull or force upon the pole itself. Poles that are 'free standing' (i.e. have no guying) may support a new cable line (or two) with no real "force" problems. Poles that are guyed because of the location to prevent them from falling over may require new guys as well when the cable line(s) are added. We'll look at that as well.

### DROP LINES

The customer tap-off line, running from the directional tap (off) device into the customer's premises, is the final connection. Within the 'drop family' of cables there are several types available, at different pricing levels:

- 1) **RG/59/U.** This is the common cable one finds in Radio Shack and through other consumer outlets. The cable is the same as you now use in your TVRO installations.
- 2) **RG/59/U with messenger.** This is the same basic '59' except that bonded to it is a steel (or aluminum plus steel) single strand of metal. This messenger is there to hold up the coaxial cable when you have a relatively long 'run' in the air between the pole and the house.
- 3) **RG/6/U.** This is a higher grade (i.e. lower loss) type of cable, physically larger than '59', which

will get you further than '59' with equivalent loss. It costs more than '59'.

4) **RG/6/U with messenger.** Again, this is the same '6' but with a steel or aluminum/steel strand molded to it as a physical aid to support the coaxial cable between the tap-off point (pole) and the building entry.

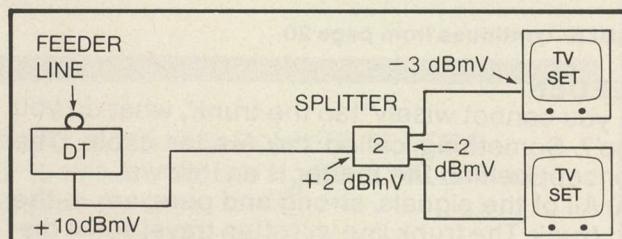
Within these categories, there is an endless array of cable choices. Some cable has a single woven copper 'shield' between the black weather-proof jacket and the inner white insulation material. Other cables have a combination of copper woven shielding and a tightly wrapped aluminum 'foil'. Still others have only the foil, although it may be in two rather than one 'layer'. All of these options are basically 'marketing gimmicks' designed to allow drop cables to be widely priced. There are performance trade offs with each decision, or price trade offs. The tighter the shield (ie. the higher the percentage of shielding; all cable manufacturers specify this and '95% shielding' would be a typical claim), the better the 'integrity' of the cable.

Let's not lose sight of the purpose of the drop cable; to connect the subscriber to the cable system, and, to insure that the cable subscriber receives a clean, interference and noise-free set of pictures and sound. If you select a drop cable with low shielding (such as 65%) and then a person in the neighborhood operates a CB radio or has an electric blanket that 'arcs' (producing interference through the air), you can reasonably expect a 'low shielding cable' to allow that interference to get into the drop cable. Remember that your feeder and trunk line cables have 100% shielding; that aluminum outer 'sheath' is total, and it completely wraps around the signals to protect them. By trying to save a few pennies per foot with cheaper drop cable, you may deliver a perfect picture right up to the pole and then degrade the service in that final run into the house by using drop cable that has 'holes in it'.

Most '59' and '6' type cables will support their own weight for runs of 50 to 75 feet. In other words, the weight of the cable itself will not cause it to droop, sag and pull apart when you suspend perhaps 75 feet of it in the air from pole to house. Beyond 75 feet, cable drops tend to cause maintenance problems unless the cable is supported; with a **messenger**. That's the reason you are given choices of non-messenger and messenger cable when you select cable.

The choice between '59', with its smaller diameter and higher losses, and '6', with its larger diameter and lower losses, is primarily one of system levels and the distance between the directional tap (at the pole) and the subscriber's television set. Some numbers.

As we will see in this series, ideally you try to pro-



**POSSIBLE LONG drop runs** (8 dB of cable illustrated)  
plus signal splitting on the house end (4 dB of additional loss) must be considered when  
'engineering'a cable drop and selecting materials.

vide a specified signal level at the output side of the directional tap on the pole. That level is +10 dBmV (10 decibels above/greater than one millivolt). This is outside, at the pole and the trick now is to get that +10 dBmV signal inside, to the TV set, with as little degradation in level as possible.

All cable has loss; even the 1 inch stuff. The '59' and '6' type cables have (relatively speaking) 'much loss'. The '6' has somewhat less loss than the '59' however. If most of your homes are going to be reached, from directional tap-off device to TV set, with 100 to 125 feet of cable, some version of 59 is probably OK. Here we are dealing with perhaps 5 dB of loss at the higher channels and that 5 dB subtracted from the +10 dBmV level at the tap still gets us into the TV set with something close to +5 dBmV. The FCC rules suggest that you should come to the TV set with between +10 dBmV and +0 dBmV. Remember that "0 dBmV" is not 'no signal'; it is 1 millivolt of signal, or 1,000 microvolts; the kind of signal you would receive perhaps 25 miles from a local line of sight TV transmitter operating with maximum VHF power.

So you elect the larger '6' type of drop cable when your drop runs average 'long' (such as 200 feet), or, when you have to do some signal 'splitting' once you get the cable drop inside. **Splitting?**

Up to this point we have assumed that each cable drop serves a single TV set. Yet most Americans have two (or more) television sets. When you take a +10 dBmV signal through cable that loses 8 dB between the pole and the TV set location, and then you need to split that signal 'in two' to serve two (or more) TV sets once inside, you have a new problem. A two-way splitter will 'divide' the signal into a pair of equal parts; that is the same as giving up 3.5 (call it 4) dB of signal at each of the two divided ports. If we had +10 dBmV at the pole, lost 8 dB on the way inside, and then had to split the signal into two parts once inside, we now have  $+10 - 8 = +2 \text{ dBmV} - 4 = -2 \text{ dBmV}$  at each of the splitter output ports. Add to that the additional cable loss from the output port of the splitter to the actual TV set. Yup, we are in the 'minus dBmV

column' and something needs to be done.

So the choice between '6' and '59' is really quite complex and may have to be done on a case by case basis; use '59' without messenger when the drop is relatively short, and direct. Use '6' with messenger when the drop is longer or use '6' without messenger when the drop is relatively short but there are 'splits' to be done once inside. We'll look at all of this in some detail before we get done.

### BARGAINS?

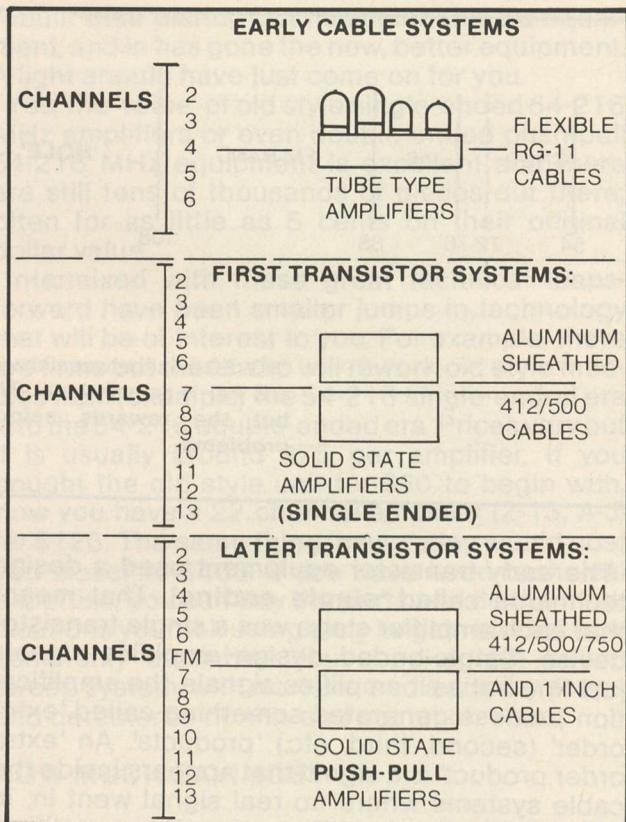
Every part of the system offers to the plant designer a bewildering array of equipment/hardware choices. There are trunk amplifiers that cost \$400 and others that can cost \$4,000 (!). There are line extenders which cost \$75 and those that cost \$400. There are cables that cost \$.10 per foot and cables that cost \$1.00 per foot. Which are the right ones for you? The answer, obviously, is "those parts which do the job to be done, in a quality way, with the lowest initial outlay of capital". Remember; we are trying to bring down the total cost of the cable plant so that our bank/loan repayment schedule is manageable given the revenue stream we can realistically expect (see CSD for November, 1986).

Let's talk frequency first since this has a considerable impact on pricing. The first thing you may notice when reviewing cable hardware catalogs or advertisements is a statement about the 'frequency/bandwidth' of the equipment. Everything, even cable itself, is specified in 'frequency'. What is that all about?

The first (very first) cable systems used only VHF channels 2 through 6. That's 54 to 88 megahertz (MHz). There were several reasons why these 1949-1959 pioneers did this.

**A)** There was no aluminium jacketed, 'secure' coaxial cable available then. The only available cable was something called RG-11/U (a bigger brother to RG-6/U) and RG-217/U (a huge brother to the RG-6). This cable was doing all it could to operate as high as 100 MHz. Higher frequencies simply 'disappeared' in this cable because the cable had such extremely high losses. (Today's RG-11/U is far better than the stuff being made in 1950; imagine, for a comparison, trying to build a complete cable plant **today** using **RG-6/U** cable as a **trunk cable** and you can see the problem!).

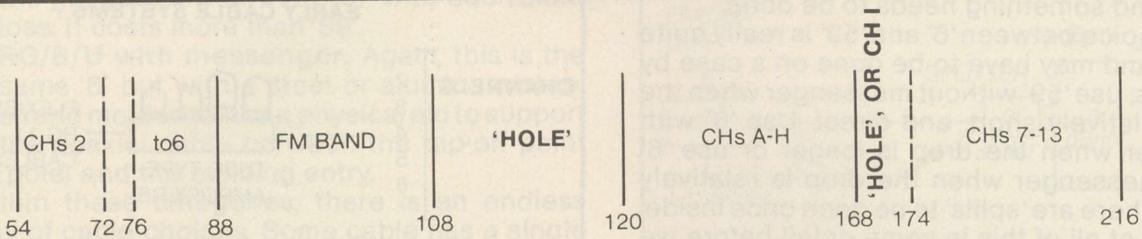
**B)** The only line amplifiers available were 'tube' amplifiers (i.e. this was before transistors came along) and the upper frequency limit of the 'tube amplifiers' was also about 100 MHz. Even if you could somehow get signal through the high loss cables, you couldn't amplify the



signals above about 100 MHz.

**C)** The customer tap-off devices we now routinely take for granted, the directional taps, did not exist. Something called a 'pressure tap' was used in the late 50s and prior to that customers were attached to the lines by simply cutting the RG-11, inserting a couple of resistors and running off to their house with a 'T' connector. That meant every cable customer on the system had direct connection to the 'trunk' and there were endless problems.

When transistors burst on the scene in 1960/61, from a small company in Arizona named AMECO and one in Canada called BENCO, the first 'all band' cable plants became practical. Now the cable systems could transport and deliver TV channels from 2 (54 MHz) to 13 (216 MHz) since the transistor amplifiers in short order were 'all band' in design (the first, from BENCO, were low band only). At the same time, by coincidence or plan, aluminium jacketed cables came along and at the same time many of the today-taken-for-granted pieces such as directional taps and directional couplers appeared. There was an immediate national upgrading of cable plants from 'low band' (channels 2-6 **only**) to 'high' or 'all band' (channels 2-13). This excitement lasted from 1960 through 1966 or so. That's when the next wave hit.



"HOLES exist between channels 4 and 5, FM and "A", H and 7 (I is actually here). They are tempting to "fill" but the rewards seldom offset the special problems.

The early transistor equipment used a design technique called '**single ending**'. That meant that each amplifier stage was a single transistor device. Single-ended design amplifies signals just fine but as it amplifies signals, the amplification process generates something called 'extra order' (second, third, etc.) 'products'. An 'extra order product' is a signal that appears inside the cable systems where no real signal went in; in other words, the amplifiers, when they amplified, were creating **new signals** in the process.

Now it happened that these extra signals always appeared in about the same frequency locations. It also happened that with the arrangement of low band (channels 2-6; 54-88 MHz) and high band (channels 7-13; 174-216 MHz), these 'extra order' amplifier created signals fell outside of these TV carriage bands. Typically, they would appear in the cable between 110 and 170 MHz. Not to matter, at the time, nobody wanted to use **that portion** of the spectrum (from the top of the FM band at 108 MHz to the bottom of the high band TV channels at 174) for anything anyhow.

Well, that changed.

When the cable operators found themselves filled up with 12 channels, and a need or desire to add new channels, they looked around for someplace to do this. The most obvious place was **between 108 and 174 MHz**. The amplifiers typically 'covered' that frequency range, even if nothing was there, but unfortunately the frequency range was filled up with system-generated (interference) signals. The solution?

**Double-ended, push-pull amplifiers.**

So back to the streets and rip out all of those 54-216 MHz single ended amplifiers and replace them with new push-pull double ended amplifiers. Now they could activate the new 'mid-band' channels from say 120-174 MHz and add new channels for the subscribers (that of course

required they provide the subscribers with cable converters to receive these mid-band channels; something we'll look at later in this series). And this was all the rage from the mid 60s to the early 70s.

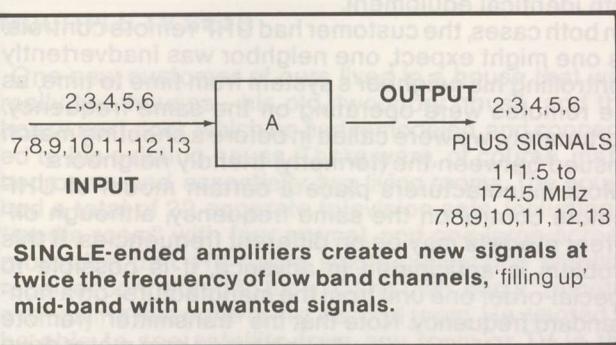
**Then along came** satellite TV and the flood of new programming services. Suddenly a system that was filled up with channels between 2 and 13, and A and H (120-168 MHz) had a new problem. It needed more 'spectrum'. Where was it coming from?

There were two directions to head; down, below 54 MHz, and up, above 216 MHz. Down was only a temporary solution (between 54 and 'O' there is but room for 8 more), and below 54 MHz there were so many commercial radio services operating that the interference could have been troublesome. So they went 'up'.

In all of this, the cable amplifier 'modules' were carefully designed to extract maximum performance out of each amplifier **within** the 'design bandwidth'. If the design bandwidth was 54-88 MHz, that's where the amplifier worked. It did not work well at 50 or 92 MHz. If the design bandwidth was 54-216 MHz, even if the amplifier was push-pull (double ended), it cut off rather sharply just below 54 and just above 216 (MHz).

In addition to this, there was another design problem. Remember that cable amplifiers have gain ratings (such as 25 dB) and that gain rating is at the highest design operating frequency (such as 216 MHz). There is less gain at lower frequencies (such as 54 MHz) because the cable amplifier wants to compensate for the cable losses in the system and the cable losses are higher at 216 than at 54.

So the cable operator 'spaces' his amplifiers. If the cable amplifier has 25 dB of 'operational gain' at the highest operating frequency, then he calculates where each amplifier is to be installed by



putting the equivalent amount of cable 'loss' between the output of one amplifier and the input to the next amplifier. If this is 25 dB of loss (amplifier gain), then the system would space its amplifiers '25 dB apart'. But, that is at **216 MHz**.

Now along comes a new amplifier design that shifts the upper frequency from 216 MHz to say 300 MHz. The amplifier gain, call it 25 dB, stays pretty much the same because there are practical limits as to how much gain you can safely get from an amplifier.

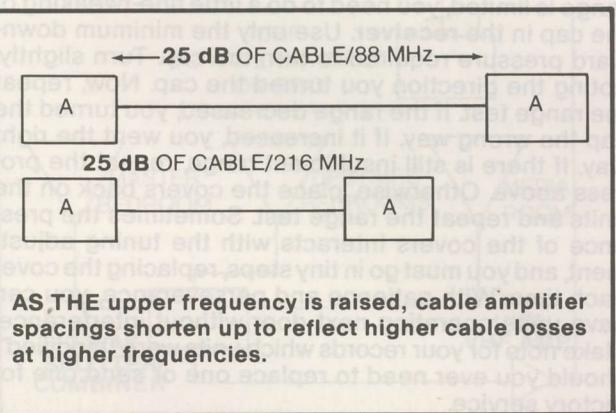
The cable operator through all of these 'changes' has had to move his amplifiers each time he upgraded his system. That's replace AND move.

#### Why?

25 dB of cable at 88 MHz is much further than 25 dB of cable at 216 MHz. And 25 dB of cable at 216 MHz is quite a bit more cable than 25 dB of cable (loss) at 300 MHz. Each time the cable operator has increased the 'bandwidth' of his cable plant, he has been forced to move his amplifiers closer and closer together. He may have been getting from headend to the end of his town with 15 amplifiers back in 1960, with a low band system. Today, with a 300 MHz system, it probably takes 30 amplifiers to cover the same distance.

**So what does this have to do with bargains? Plenty.**

Each time one of these 'orders of magnitude' improvements in cable hardware has occurred, hundreds (or thousands) of cable operators have



rebuilt their plants. Out has come the old equipment, and in has gone the new, better equipment. A light should have just come on for you.

Yes, the 'value' of old style single-ended 54-216 MHz amplifiers or even double-ended push-pull 54-216 MHz equipment is excellent and there are still tens of thousands of pieces out there; often for as little as 5 cents on their original dollar value.

Intermixed with these great technical leaps-forward have been smaller jumps in technology that will be of interest to you. For example, there are firms out there who will rework old style modules from (example) the 54-216 single-ended era into the 54-216 double-ended era. Prices vary but it is usually around \$75 per amplifier. If you bought the old style unit for \$50 to begin with, now you have a 22 channel amplifier (2-13, A-J) for \$125. The same thing, new, today would cost you closer to \$400. If you have keen technical expertise, you can buy the parts and do the modifications yourself using plug-in 'gain blocks' now commonly available. You need a test bench sweep system, with markers, and a display scope and detector to do this and not much else.

#### HOW MUCH SAVINGS?

If we assume that you have five amplifiers per cable mile and you are looking at \$400 each for new amplifiers, your mile-budget is \$2,000. For amplifiers. To that you add the cable, the passives, and the labor. It comes to \$5,600. Now, if you can switch those \$2,000 amplifiers 'out' and plug in five rebuilt amplifiers with a total cost of \$600, your per mile budget just dropped \$1,400 or 27%. Wouldn't you like to increase your cash flow in the operating system by 27% or reduce the monthly payments by 27%? Of course you would!

This series will continue in January 1987 CSD.

#### HOW LONG DOES IT TAKE YOU TO TROUBLESHOOT A TVRO?

If it's more than 10 minutes, you're wasting your time and the customer's money. You owe it to yourself to investigate SAT WIZARD™, the satellite signal generator tester that goes directly to the problem WITHOUT parts substitution. For free info call 1-800-334-4066 or 1-803-534-7559.

## DEALER SERVICE BENCH

by Alli Lake

Here's a product someone needs to design, develop and market; a **re-clammer** and buffer board. As most of you know, the M/A-Com Videocipher 2000 requires two video inputs for baseband video mode operation, one, is the unclamped video used for scrambled programs, the second, is a clamped video input to pass through non-scrambled programming.

The problem is only certain receivers, such as the Kenwood KSR-1000, offer both outputs **simultaneously** on the rear panel. Some receivers, such as the DX, have a clamer ON/OFF switch on the rear panel. If this switch is **left off**, unclamped video is used all the time, resulting in a **flicker** on non-scrambled channels using required EDS, or energy dispersal signal, which a clamping circuit is normally used to remove.

Still other receivers which do not have a 70 MHz loop feature must be modified internally, sometimes resulting in a **permanent unclamped output**. The only thing that can be done at this time is to use a Y-Adaptor to feed both video inputs with unclamped video. This ranges from annoying to completely unsatisfactory performance on non-scrambled services, depending upon how the customer's television handles the 30-Hertz EDS waveform upon which the video signal rides.

The proposed clamper/buffer board would do two things:

**One**, it would buffer, or isolate the unclamped video input from the rest of the circuit, and provide an output with an identical unclamped output as the input.

**Second**, it would re-clamp the video signal, and provide a clamped video output to the Videocipher unit.

One problem which the designer will have to address is the varying levels of video put out by different receivers. He may handle this with a video level adjuster control, or may have an automatic gain control, although this is difficult to realize with constantly varying video levels. In order to make this adaptor universally acceptable, he should probably provide it with its own power supply. While adequate power may be available inside the receiver, some people may not wish to open their receiver in order to get power for the re-clamping unit.

Okay guys, lets get those soldering irons hot!!

### UHF Remote Problems

In two separate cases, we had next-door neighbors

with identical equipment.

In both cases, the customer had UHF remote controls. As one might expect, one neighbor was inadvertently controlling his neighbor's system from time to time, as the remotes were operating on the same frequency. Fortunately, we were called in before a shouting match ensued between the (formerly) friendly neighbors.

Most manufacturers place a certain model of UHF remote control on the same frequency, although different **models** may be on different frequencies. If this problem is anticipated in advance, it is possible to special-order one unit from the manufacturer on a non-standard frequency. Note that the "transmitter" (remote control) and the "receiver" (which may be a motor drive unit, or a **Satellite receiver**), must be tuned to the same frequency to operate; that is, they must be "matched". When you run into this problem in the field, with the equipment in place, it is often possible to field-tune the units. **Be warned**, however, that this is a tricky job, and requires care and patience. Begin by acquiring a **non-metallic** tuning tool. These are made either of plastic or fiberglass, with the fiberglass ones being stronger. These may be obtained through TV part-supply houses, or the plastic ones, at least, may be obtained through Radio Shack.

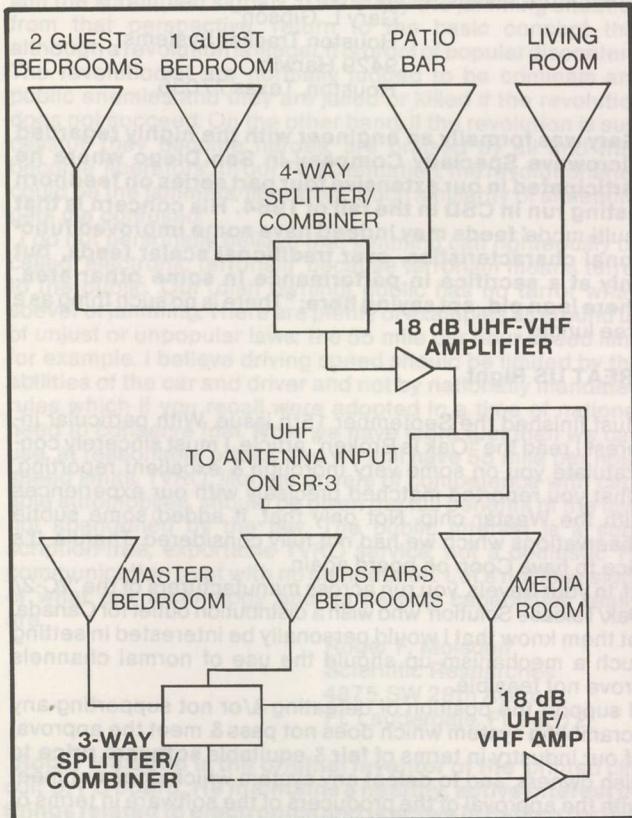
Now, you must obtain access to the circuit boards of the transmitter section of the remote control, and the receiver board in the controlled device. These are both usually tuned by a variable capacitor. This may be a set of plates that intermesh when a screwdriver-slot is turned, or, may be a very low-profile device, again having a screwdriver slot on the top, but made of a ceramic material. If there is more than one variable capacitor in the area, it would be a good idea to consult with the manufacturer before "tweaking". The next step, is to **detune** the transmitter. This involves turning the variable capacitor very slightly, and observing if operation of the receiving device still takes place. If it does, turn the capacitor a little more. If the controlled device no longer responds to the remote, then the remote is now operating on a **different frequency**, and probably is no longer interfering with the other unit as well. The next step is to align the receiver board to the new frequency. Using your non-conductive tool, slowly turn the tuning capacitor on the **receiver board** while transmitting commands with the remote control. When the controlled unit responds, **stop** turning the capacitor. Now, it is time for a range test. Walk away from the controlled unit with the remote, transmitting commands. If the range is limited, you need to do a little fine-tweaking of the cap in the **receiver**. Use only the minimum downward pressure required to turn the cap. Turn slightly, noting the direction you turned the cap. Now, repeat the range test. If the range decreased, you turned the cap the wrong way. If it increased, you went the right way. If there is still insufficient range, repeat the process above. Otherwise, place the covers back on the units and repeat the range test. Sometimes the presence of the covers interacts with the tuning adjustment, and you must go in tiny steps, replacing the cover each time. With patience and perseverance, you can have units operating next door without interference. Make note for your records which units were "modified", should you ever need to replace one or send one for factory service.

### MULTIPLE TV SETS

One new customer of ours lived in a house that was really two houses - his old, two-story house, and the house next door, which he had remodeled, and connected to his existing house. There were, of course, many bedrooms, and, essentially, two living rooms. The house had a total of 22 separate television sets, including a "media room" with four normal, and one large-screen projection unit. He had a single-conversion satellite receiver connected to his existing dish, and a "remote-eye" giving him control in a second room. He wanted to be able to see satellite from any room or TV in the house, combined with cable TV, and he wanted control of his satellite system from every TV in the house. Oh, yes, he did not want 22 "remote eyes" to accomplish this! It seemed to us that a UHF remote-controlled satellite receiver/motor drive with on-screen display would help us achieve this goal. We selected the USS/MASPRO SR-3, a choice which we were very happy with. The house had already been outfitted with (Winegard) VHF/UHF distribution amplifiers, which were now carrying the cable TV signal. Also, they had an inexpensive VHF and midband to UHF block convertor in this system. With the modulated RF output of the SR-3 connected to this convertor, the signal was distributed on top of the cable TV signal. We would have preferred to use a commercial superband or hyperband modulator, but this is what they wanted at the time: a UHF/VHF/Midband/Superband combination. Of course, UHF/VHF splitters had to be installed at many TV locations. Now the problem was in getting remote control

operation at all televisions. We had anticipated the use of an additional (UHF) antenna to pick up the signals from the remote controls (they now had six) but one antenna proved woefully inadequate. When we installed a VHF/UHF broadband amplifier in this line, the range of the remotes **decreased!** This indicated to us that either the remote control receiver board was being swamped by an increase in its noise floor, or that we were amplifying another signal on the same frequency as our remotes. The house was located close to a tall building whose roof bristled with antennae, used for mobile telephone, paging and business communications. We thought that perhaps this was our noise source. Since our spectrum analyzer was not designed to give extremely accurate frequency readings, (this is not often required) we borrowed an \$18,000 or so Tektronix spectrum analyzer to first determine what was on or close to our remote's frequency, and then to find a "clear" space to move our remotes to in frequency. It turned out that this was an **early** version of the SR-3 which used the UHF television band for remote control, and our unit happened to be right on the aural carrier frequency of a local UHF television station! After contacting USS, which was very helpful, we learned that we had considerable freedom in the tuning range in which these remotes would operate. We selected a frequency with little interference and retuned all 6 remotes to that frequency. Now, the U/V amplifier did increase our range, but not nearly what we needed. Remember, that this house had two "exterior" walls separating the two sections; this was thick concrete block work, not wallboard. Also, there was a considerable distance from one end of the house to the other. As an additional complication, one TV was located **outside**, at a patio bar. It became clear that several antennas would be required, placed throughout the house to obtain the required results. We selected the Radio Shack "Golden-U" antenna because of its compact size, and soldered a matching transformer to the twin lead wire coming from each one. We then carried the remote signals on RG-6 coax, combining two sets of antennas, and amplifying each set. The fact that this house had three separate attics did not make our job any easier. We had to use existing speaker cables as "pull wires" in running our coax from the new section into the old. In the end, we had three antennas in one set, and four in the other, amplified separately. (The amplifiers really did little more than make up for coax and splitter losses.) One antenna in the attic was at the edge of the wall/roof junction, aimed at the patio bar: two were behind television sets, the rest in the attic, pointed **down** into the rooms below. After too many hours in the attic, the customer had remote control from all 22 TV sets with his six remote controls.

**I would not do it again.**



DIAL THIS NUMBER -

**305/771-0575**

## INDUSTRY AT LARGE

## CORRESPONDENCE, NOTES, REBUTTALS AND CHARGES . . .

CST provides this industry 'forum' for the purpose of allowing members of the industry to comment on industry activities. CSD assumes no legal responsibility for statements made here and those providing such communications are held liable for their statements directly.

### FEEDHORNS/Again

Please pardon the delay in getting this material on horn antennae out to your office. We're all busy these days but I won't offer any lame excuses.

The source of this material is **Antenna Engineering Handbook, 2nd Edition**, Richard C. Johnson, Henry Jasik, McGraw Hill Publishing Co, ISBN 0-07-032291-0. This book is generally considered to be "The Bible" of antenna design among the engineers with whom I am acquainted, most notably those fine fellows at Microwave Specialty Corporation in San Diego, CA.

As you are aware, a microwave reflector/feed is somewhat more complex an apparatus than mere appearances would indicate. As in any other dynamic system involving one or more variables, it is difficult to change or tailor a single aspect or parameter of the antenna system without materially affecting some other. Perhaps it would be simpler to say that there are going to be tradeoffs when you attempt to maximize a single operational characteristic of such a system... say, gain, for instance. Further, it will generally be at the expense of some other (unfortunately) equally desirable or important characteristic, bandwidth perhaps.

Even the thin wire balanced dipole, a seemingly simple device, becomes incredibly complex when you begin to consider the detailed physics involved. For example, the gain of the dipole for a given frequency is determined by its impedance at said frequency. The impedance is determined by a combination of factors including the effective length of the dipole elements (usually expressed in degrees as a portion of a wavelength of a given frequency), the ratio of the cross sectional diameter of the elements to their effective length, the conditions existing at the dipole termination (where it joins the transmission line it is feeding or being fed from) and so on and so forth ad infinitum.

To be terribly simplistic, ignoring all of the aforementioned complexities, we could say that in general, for a 1/4 wave (90 degree) dipole with elements of given fixed length, that there is one and only one frequency at which maximum gain can be achieved. Even though broadbanding techniques may be employed to broaden the gain peak, providing increased gain over a broader range of frequencies, there will still be one fixed frequency at which maximum gain will occur. Any deviation whatsoever, no matter how slight from that precise frequency will result in a finite, if in most cases unmeasurable, degradation in gain.

Now, let's extrapolate this example to the commonly used "point source" or "prime focus" feedhorns currently in use on consumer satellite systems. It must be said that a great deal of time and engineering effort have gone into developing a device which, through a series of well thought out compromises (tradeoffs), gives an optimum amount of gain versus noise performance over the 500 MHz wide bands of signal frequencies which we are constrained to use for domestic C-band and Ku-

band downlink receive applications.

Again, to be simplistic, it would certainly be possible to redesign these horns to have greater bandwidth or greater gain at a given frequency (or a given narrower band of frequencies) but damn near impossible to do both simultaneously. I'll qualify that statement by saying that it could be done if certain fixed physical characteristics of the horn such as length, flare angle, and aperture diameter could be independently and continuously varied over some finite range, but economically speaking, I just have neither seen nor heard of any such device that could be considered even remotely applicable in the consumer market.

This applies to multi-mode horns where multiple rays are phased to increase efficiency for increased gain at some fixed frequency or some narrow band of frequencies. The tradeoff in this case, obviously, is bandwidth for gain.

If you do come across a moding feed that delivers increased gain versus noise performance over a 500 MHz bandwidth, one that can be mass produced economically and perform dependably, please let me know. I want to invest in it.

Gary L. Gibson  
Houston Tracker Systems  
9429 Harwin  
Houston, Texas 77036

**Gary was formally an engineer with the highly regarded Microwave Specialty Company in San Diego where he participated in our extensive four part series on feedhorn testing run in CSD in the fall of 1984. His concern is that 'multi-mode' feeds may indeed have some improved functional characteristics, over traditional scalar feeds, but only at a sacrifice in performance in some other area. There is an old, apt saying here; "There is no such thing as a 'free lunch'".**

### TREAT US Right

Just finished the September 15th issue. With particular interest I read the "Oak Is Broken" article. I must sincerely congratulate you on some very thorough & excellent reporting. What you reported matched precisely with our experiences with the Westar chip. Not only that, it added some subtle observations which we had not fully considered. Thanks. It's nice to have Coop on board again.

If, in your travels, you run across manufacturers of the 'VC-2/Oak/Telease Solution' who wish a distribution outlet for Canada, let them know that I would personally be interested in setting such a mechanism up should the use of normal channels prove not feasible.

I support the position of defeating &/or not supporting any scrambling system which does not pass & meet the approval of our industry in terms of fair & equitable software price to dish owners, and to defeat any system which does not meet with the approval of the producers of the software in terms of

they receiving fair & equitable payment.

Our retail operation has been rolling along a good three years now and I am pleased to report that not one member of our family of customers has elected to purchase a VC II. Such will not be the case when the VC/Oak clone appears.

Your Earth Station Co., Ltd.  
5321 TransCanada Highway  
Duncan, B.C. V9L 3Y1

**OAK** has struck back. They have been testing an improved version of Orion scrambling which appears to get around the John Davidson 'chip' system. Two racing service feeds are now testing the improved Orion service and those using Davidson's Orion buster chip report that while there is limited (read intermittent) video descrambling with the improved system, there is no audio recovery. Davidson has formally withdrawn from the scrambling busting business, so it would appear his talents are no longer available to TVRO. Can the improved Oak system be beaten by a modification of the Davidson work? Stay tuned!

#### JAMMING IS OK . . . If

Although I would not recommend that people in our industry utilize our technology to jam scrambled transmissions, I must in conscience admit that under special circumstances such as the 'take over' of a local TVRO dealership by the cable consortium, it could be the only remaining solution because sometimes the law is wrongfully used to protect the criminals. An example; it is wrong to assault someone and is punishable by law. However, if you come across a situation where one person is assaulting another, you become a hero in the eyes of the law and the community if you take up the defense of the person being assaulted and yourself assault the attacker. In our situation, the vicious attacker is the cable programming trust, and the innocent victim is the TVRO owner and the TVRO dealer. The rescue assault team might be those who would jam the scrambled signals. If we study the jamming situation from that perspective, return to the basic concept that although a revolution is illegal, it is proof of popular discontent. The revolutionaries are normally judged to be criminals and public enemies and they are jailed or killed if the revolution does not succeed. On the other hand, if the revolution is successful, they become heroes, are praised by all and they become 'liberators'. In our TVRO situation, the revolutionaries could be the jammers/liberators. Such similarity of situations gets me confused!

I do not personally believe that jamming can righteously be called 'electronic terrorism' because terrorism means terror to the public. Our (dish owning) public has no terror whatsoever of jamming. There are plenty of examples all around us of unjust or unpopular laws; the 55 mile per hour speed limit for example. I believe driving speed should be limited by the abilities of the car and driver and not by nationally mandated rules which if you recall were adopted in a time of national need to conserve fuel. Now we have more fuel than we can use, at reasonable prices, and we still have 55 mile per hour speed limits. TVRO, like the drivers of competence with capable automobiles, should be given the full benefits of the law, not abandoned by the law. The public interest is a subscription-free, exportable TVRO service, not a domestic TV communication trust with no competition. Let's not lose sight of what our technology and its service capabilities really are.

Roger F. Moisdon  
Scientific Researches  
4875 SW 28th Avenue  
Ft Lauderdale, FL 33312

**Roger Moisdon** is the original inventor of the 'printed circuit' or PC board. He maintains a healthy, active interest in things related to electronics and is active in calling for the

American exporting of TVRO technology and programming on a worldwide basis.

#### 20,000 DISHES/Scrambled

I am very interested in the scrambling issue because I live in Tijuana, Mexico. This is important because to the best of my knowledge none of the programming firms such as HBO are prepared to offer scrambled services or descramblers to people who live outside of the USA. My own dish was but one of 3,600 dishes sold by the dealer, with whom I did business, in a six month period of time. By best estimates in the local press, there are more than 20,000 dishes in the immediate vicinity of Tijuana and each of these is slowly going dark because of the scrambling situation. There needs to be a reappraisal of the entire scrambling situation; I do not think it is wise for a handful of US cable programmers to have so much power as to shut down tens of thousands of dishes located outside of the USA.

Juan Olmos  
Tijuana, Mexico

Too little attention has been focused on the plight of the out-of-USA users of TVRO. Most areas where TVRO is popular are located where no direct American (as in US) reception is possible, except by satellite. To take away reception that has been available for more than six years is a definite hardship on the affected people. Our sources tell us that a very significant portion of the descramblers sold and now authorized have gone outside of the USA in suitcases and shipping cartons. Some estimates run as high as 50% of the total number of descramblers now operating. This only makes the true HBO situation worse for in their rush to scramble, they have forced other programmers such as CNN to adopt a policy which does not serve American overseas interests well at all.

#### JERUSALEM TVRO?

I have just read with great interest Coop's article appearing in the November 1986 issue of **Home Satellite TV**, and his trip through the South Pacific. The situation described closely parallels that we see emerging for the Middle East AFRTS transmissions directed to Italy are about the only (4 GHz) feeds available to us in the region with reasonable sized dishes.

I live in Jerusalem and I am currently traveling here in the states on business and investigating the TVRO business here. I would like to know if AFRTS plans any transponder changes to implement scrambling in the next year, and if so, what changes and system they will use. I also noted in CSD you have mentioned a transcoder which provides NTSC to PAL conversions. Do you know where these transcoders are available, at reasonable prices and whom I can contact for more information? They will be necessary for Israel systems for those customers who do not have multi-standard television sets.

David Schlact  
1116 Broadway  
Barstow, CA 92311

AFRTS has not revealed their chosen scrambling system but if we were 'betting' we would suggest it will be B-MAC and the equipment will probably come from S/A. The use of B-MAC in Australia, South Africa, North America and soon (PR) China has given emphasis to understanding and then breaking the system. If AFRTS goes with B-MAC, we feel that will be the 'final blow' to attract to B-MAC the same intensive, international interest which ultimately resulted in the downfall of Videocipher. As for transcoders, we suggest readers contact Mike Stone in England at 272-554-535.

## TRANSPONDER WATCH

### RECENT REPORTS OF ACTIVITY ON DOMESTIC / INTERNATIONAL SATELLITES

Send your reports to CSD Transponder Watch, P.O. Box 100858, Ft. Lauderdale, FL 33310. For late news, call (305) 771-0505.

**CSP** International asks for \$2,500 for a copy of their latest home dish industry study titled "Home Satellite TV: From Crisis to Success". In it, they claim Videocipher sales will total 200,000 descramblers in 1986 and 'soar' to 600,000 descramblers in 1987. Information from 212/686-0086.

**WILLIAM REED** of Link Resources has issued prognostication for future of TVRO. He expects scrambling to hurt but not to kill home TVRO; says he feels there are 1.2M home dishes now in operation, sees market growth to 2.3M by 1990. Before scrambling, he estimated marketplace would grow to 3.5M system units by 1990. If he is correct, industry will sell 0.8M units during 1986, '87, '88, '89 and '90 or approximately 160,000 per year on average. Industry at this point in 1986 may have retailed 95,000 units tops.

**K-MART** with assistance of GTE plans 2,100 store chain Ku band network to be completed by 1990. Cost of the system will be over \$40M and it will be used to expedite credit card verification, track buying trends, improve store inventory controls. GStar will supply the space segment and installation of first terminals will begin immediately.

**FRENCH** are planning for dedicated military satellite system as possible replacement for present combination commercial and military system.

## 'MY VIEW'

by Peter C. Sutro

Associate Editor/CSD

### REQUIEM FOR SPACE

I was not there in the beginning, in San Jose, California, on July 4, 1980, when a little band of pioneering entrepreneurs including Bob Cooper, Rick Brown, Bob Behar, Andy Hatfield and some others whose names you would hardly recognize and some who are, sadly, no longer with us, elected a youthful-looking Taylor Howard as the first President of SPACE, the apt acronym

**M/A-Com** reports order for Service Merchandise store chain to supply 'Gemini 56' very small aperture terminals for the firm's private satellite data network.

**TEXAS** Instruments has completed an Artificial Intelligence Satellite Symposium international teleconference sent to more than 30,000 participants at more than 500 receiving sites. The program was also sent to Europe via satellite.

**EOHIPPUS PROBE** is cunning 30" long 'test instrument' that is self propelled and carried into space 'piggyback' on board virtually any launch system. Probe can self propel to location of satellite and perform diagnostic analysis of ailing satellite and then report back to ground the probable cause of satellite failures. JP Aerospace is developer of system and 1988 test is planned.

**TELEPORT** International wishes to establish a specialized business in Jamaica to process data information and to handle 800 number order processing. System would use satellite interconnection to states and allow Jamaican English speaking personnel to handle and process 800 number orders and queries at a fraction of costs of similar stateside operation. Plan must receive FCC and perhaps Intelsat approval since it involves interconnection of Jamaica to USA using US domestic satellite.

for the Society for Private and Commercial Earth terminals. But I was there, in a small hotel conference room in Alexandria, Virginia on July 30, 1986, when a bare quorum of the SPACE Board Executive Committee voted dispiritedly to empower an older and tired-looking Taylor Howard to proceed with plans to merge SPACE with DBSA, the Direct Broadcasting Satellite Association, to form the unpronounceable acronym SBCA (Satellite Broadcast and Communications Association of America). And I was there, serving on the Board of SPACE for almost four of the turbulent years which were encompassed by those two meetings.

It is not my purpose here to write a history of the SPACE years - a long and fascinating book could, and well may be written on the subject - but simply to chronicle some of the high and low-lights of this association which waged a David and Goliath battle with some of the most powerful and entrenched business interests in the country - the Broadcasting, Motion Picture, Cable TV and Sports Industries.

**JULY, 1980** - SPACE is officially formed with 150 members and elects Taylor Howard its first President and Rick Brown its legal counsel. Representative Richardson Preyer introduces in Congress a bill, HR7747, which, if passed, would make the reception of satellite television signals illegal and punishable with fines of up to \$1,000,000 and prison terms.

**AUGUST, 1980** - Taylor Howard and Rick Brown visit Congress to lobby against HR 7747 and start the lengthy and tedious process of educating The Hill about the wonders of satellite television.

**NOVEMBER, 1980** - After many attempts by Rep. Preyer to tack his bill onto several others as amendments, SPACE succeeds in having the bill withdrawn. Rep. Preyer is defeated for reelection but Rick Brown warns that "the battle is by no means over". This was a remarkable victory for the fledgling SPACE against HBO (et al), the Motion Picture Industry Association and NCTA.

**DECEMBER, 1980** - SPACE files a reply to an FCC Notice of Inquiry stating that "as responsible members of the communications community, the users of earth stations should pay the marketplace price for the use of 'subscription' programming. Neither SPACE nor its membership desire a free ride". This position will be the key to many later victories in Congress and the FCC.

**FEBRUARY, 1981** - SPACE files a petition with the FCC to block the purchase by Westinghouse of the TelePrompTer Corp. Although unsuccessful, it showed that SPACE was willing to attack what it considered anti-competitive practices (TPT owned 50% of Showtime).

**OCTOBER, 1981** - California's Congressman Henry Waxman (his district includes Hollywood) introduces legislation (HR 4727) designed to make the viewing of satellite signals illegal.

**MARCH, 1982** - At the Fort Worth STTI show SPACE votes to inaugurate their own industry show which starts the long-simmering feud with Rick Schneringer who has bought the show business from Bob Cooper and feels that an industry association should not compete with its own members.

**JUNE, 1982** - Senator Goldwater introduces a bill (S 2172) which contains Section 705, which would make satellite reception illegal. The Waxman bill, meanwhile, is bogged down in procedural delays.

**AUGUST, 1982** - Rick Brown reports at the Omaha SPACE trade show that the damaging Section 705 has dropped the "signal piracy provision". Much credit goes to SPACE members who flooded Congress with visits, telegrams, letter and phone calls. This was a monumental victory as only SPACE lobbied against Section 705.

**JANUARY, 1983** - SPACE tackles the zoning problem which is becoming more and more acute in many municipalities. Over the next few years SPACE will win many battles, lose a few and culminate with a triumph when the FCC publishes its Report and Order in 1986 making the discriminatory restriction of earth station installations illegal.

**MARCH, 1983** - The SPACE Board votes in Las Vegas to hold two trade shows per year in direct competition with Rick Schneringer's STTI shows. This will turn into a battle royal starting with the Can-Am STTI show in Minneapolis in July and culminating at the Orlando SPACE show in November with its industry-destructive aftermath.

**NOVEMBER, 1983** - The SPACE show in Orlando saw a compromise solution worked out with STTI's Rick Schneringer on the show issue. The newly elected SPACE Board with Peter Dalton of KLM as President offers Rick Schneringer a "deal he can't refuse", and, he accepts it. Bill Young of the Satellite Financial Planning Corp. proposes a floor planning and warranty

insurance program with \$750,000,000 to back it up. This will prove to be one of the most controversial issues in SPACE's history. The big Orlando banquet is keynoted by Ted Turner and addressed by Sen. Barry Goldwater, both of whom profess great support for the TVRO industry. Euphoria among manufacturers, distributors and dealers is high as the industry starts being taken seriously and SPACE has fought off most legal and legislative attacks... or so it seems.

**DECEMBER, 1983** - Shortly after the Orlando show it becomes clear that Rick Schneringer has had second thoughts about his arrangement with SPACE. The solution of combining forces for one show in Las Vegas in mid-March is scrapped and the industry faces the prospect of two separate shows in Las Vegas overlapping by one day.

**JANUARY, 1984** - At the SPACE Board meeting at the CES show in Las Vegas, Schneringer files a multi-million dollar law suit against SPACE, its Board, Peter Dalton and Rick Brown. Almost simultaneously, Bill Young of SFPC threatens action against SPACE for refusing to endorse its program. And another bombshell in the form of a law suit by a local cable company against a TVRO dealer, Starlink of Wichita, Kansas, is filed for "illegally" demonstrating satellite reception in a public place threatens to destroy the TVRO industry and will occupy much of SPACE's time and money in its eventually successful defense.

**FEBRUARY, 1984** - As SPACE gears up for its own show in Las Vegas on March 18 and pursues its legal defenses against STTI, it belatedly comes to the realization that it needs a full-time executive to manage its affairs so that it can stop relying on the law firm of Brown & Finn to carry out its administrative work. This had been voted some 18 months earlier but inertia had kept the project from moving along.

**MARCH, 1984** - Less than 10 days before Las Vegas, SPACE has the good fortune to hire Chuck Hewitt to fill the long-needed post of Executive Vice-President. He is introduced at a marathon Board meeting and is immediately faced with dozens of pressing problems in need of immediate solutions. He wisely seeks out Rick Schneringer and introduces himself as the "new face at SPACE". The two hit it off and start a protracted negotiation which eventually leads to a compromise solution in May between SPACE and STTI. All law suits are dropped and peace is restored with joint shows planned. The high point of the Las Vegas SPACE show comes on banquet night when, with two ballrooms overflowing with enthusiastic TVRO people but with only a handful having foreknowledge, a direct via-satellite downlink from Washington, D.C. brings Senator Goldwater and Representatives Gore, Tauzin and Rose announcing the introduction of legislation which would be known as the Satellite Viewing Rights Bill. The cheers are deafening and SPACE is the hero of the hour.

**JULY, 1984** - David Johnson, Chairman of SPACE, attacks the organization in print for, among other things, its lack of fiscal responsibility. Money has always been a problem at SPACE and now, with its many legal and legislative efforts, it becomes crucial. Johnson's attack causes an over-reaction from the Board and he is censured and dropped as Chairman at a two-day meeting in Michigan. It also votes to expand the Board to accept all qualified TVRO industry members who wish to par-

ticipate. This will create a Board of over 40 people.

**SEPTEMBER, 1984** - The first joint SPACE/STTI show takes place in Nashville. The new "expanded" Board sits for the first time with "Bud" Ross of Birdview as Chairman and Taylor Howard as President. HBO's imminent scrambling is discussed at length and counter-measures are planned. It is felt that "access" is the paramount issue as well as fair pricing. Bob Cooper gives a party to celebrate the fifth "birthday" of TVRO. KLM became the first major company to go out of the satellite business. It would soon be followed by Intersat, Automation Techniques, Locom, Amplica, Lowrance, Hytek and many others.

**OCTOBER, 1984** - Congress passes the Cable Bill onto which has been tacked the Satellite Viewing Rights Amendment. Rick Brown and SPACE have performed one of the miracles of legislative legerdemain. In a bare six months from their introduction the bills are passed into law and signed by President Reagan making TVRO legal and removing forever the stain of "pirate" from our industry. This seems to be the solution to all the industry's problems and it looks forward to 1985 with tremendous optimism. Home installations are "peaking" just below the 100,000 per month level.

**MAY, 1985** - HBO starts partial scrambling using the M/A-Com VideoCipher II system. Owners and potential buyers of home satellite systems start to get the feeling that the free lunch is about over. Despite legislators' promises that "the skies would not go dark" there is a growing feeling that SPACE is in for the battle of their lives to work out an acceptable scenario under which the industry can thrive and survive in a scrambled environment.

**JULY, 1985** - More and more programmers, prodded by the cable industry, announce plans to scramble. We assume that all the film-based services will be forced by their suppliers to encrypt, but we feel that the advertiser-supported services such as CNN, ESPN, CBN and the superstations will remain in the clear. **Not so!** Retail sales start slipping. Good news - the Starlink case is ruled in favor of the satellite dealer. SPACE is again a hero.

**SEPTEMBER, 1985** - Nashville again and the dark clouds are starting to be visible on the horizon. However, Rep. Wright, now Speaker of the House, has some kind words to say about the satellite industry and Rep. (now Sen.) Gore tells us that the invasion of the "encryptors" will not happen. HBO starts scrambling 12 hours per day and Showtime and the Movie Channel began testing.

**OCTOBER, 1985** - SPACE stages a spectacular "Earth Station Day" in Washington, D.C. It is a great success but severely strains the SPACE budget which has already seen signs that its most loyal members are unable to support it due to flagging sales. Rick Brown is severely criticized for forming Viewers First to sell SelecTV(scrambled) to the home Earth Station world. It seems to many that this weakens Rick's position vis-a-vis the Congress.

**JANUARY, 1986** - The Ides of January, the infamous S-Day when HBO scrambles full-time, accompanied by an unbelievable disinformation campaign started by the cable companies sends satellite system sales crashing. Best estimates show that from 75,000 installations per month the rate has dropped to under

10,000. With Congressional hearings scheduled for the spring, SPACE's funds are at rock-bottom and manufacturers are unable to help.

**FEBRUARY, 1986** - Back to Las Vegas with the industry in turmoil, SPACE puts on a brave front. Showtime announces that it wants to deal on a friendly basis with the TVRO world but no third party marketing is in the offing to create a truly competitive environment. You buy your programming through your friendly cable company or through the programmers - period.

**MARCH, 1986** - The long-delayed Congressional hearings on TVRO and scrambling take place. Taylor Howard and Rick Brown present SPACE's position effectively and Congressman after Congressman sympathize with their position, at the same time castigating HBO, Showtime, the broadcast interests and the cable industry for stonewalling the issues. A lot of words, but one feels that little action will result. Rep. Wirth promises a second day of hearings and Rep. Tauzin suggests that it be scheduled soon or it will be all over for the TVRO industry.

**APRIL, 1986** - Captain Midnight jams HBO's signal for a few minutes, causing an uproar in the communication world. SPACE condemns the action as electronic terrorism while sympathizing with the frustrations which led to such an act. On balance, the incident does not do the TVRO image any good.

**MAY, 1986** - SPACE and Showtime hold a press conference on the USS Intrepid in New York to announce the full-time scrambling of the Showtime and Movie Channel feeds and to try to avoid the negative publicity which surrounds the HBO scrambling. It is only a 'qualified success'.

**JUNE, 1986** - The Dallas STTI show is so badly attended that the SPACE Executive Committee does not even have a quorum. Rick Brown reports on the progress of the Privacy Bill which contains language which could be damaging and on the Copyright Bill which would make it legal to sell super-station signals to TVRO. It is clear there is no money in SPACE's war chest to fund any major campaigns. This is probably the lowest ebb for SPACE and the TVRO industry. Rumors of bankruptcies abound.

**JULY, 1986** - SPACE holds an Executive Committee meeting in Alexandria, Virginia and votes to empower Taylor Howard and Chuck Hewitt to seek a merger with DBSA. Rick Brown announces that he is no longer a part of Viewers First and the Satellite Viewers Rights Coalition is formed under his direction to carry on the legal and legislative efforts if funds can be found. To the horror of many, HBO and Showtime become members of SPACE. The next day the Senate holds its hearings and many Senators, in particular Sen. Gore, take HBO and Showtime to task for anti-competitive practices and kickbacks(BUD's) to the cable industry. But again, as with the House hearings, it seems to be a lot of pre-election posturing with no real substance. The anti-TVRO forces insist that the marketplace is working while over half the dealers in the country have abandoned the industry.

**SEPTEMBER, 1986** - The industry regroups in Nashville with a mild feeling of optimism that the worst is over. SPACE's merger with DBSA is ratified by the full Board. Sen. Gore introduces S 2823 which would force programmers to sell to TVRO owners through third

party packagers.

**OCTOBER, 1986** - The Gore Bill is defeated by the narrow margin of six votes when a much larger defeat was predicted. It is felt that it has a good chance of passing in the next session in Congress. The Privacy Bill passes without the criminal penalties for watching back-haul feeds and similar transmissions. The Copyright Bill is bogged down so the legality of licensing super-station feeds for TVRO use is still in limbo.

**NOVEMBER, 1986** - SPACE and DBSA announce that the newly merged associations will be called the Satellite Broadcast and Communications Association of America or SBCA. Taylor Howard is to be the Chairman and Dan Zinn of Hughes Communications and Marty Lafferty of Turner Broadcasting are to be Vice-Chairmen. A dinner is to be held at the Western Cable show in Anaheim in early December to celebrate the merger.

So what does the future hold for SPACE or the newly named SBCA? Clearly it will be very different from the organization we had grown to love, and sometimes hate. The members of the new Board will not be the entrepreneurs who created the TVRO industry and they will not be able to "swing" the way the old Board did. Each will be answering to a higher corporate authority with very different objectives in mind. Rick Brown and his Viewers' Rights Coalition will try to keep up the enthusiasm for funding the legal and legislative work which he has fought so hard to promote over the years. I'm afraid that it will be difficult to maintain that

enthusiasm unless sales of TVRO's increase dramatically. On the other hand, Taylor Howard's view of the future envisions tens of millions of satellite receiving antennas at C and Ku-Bands requiring the participation of very large corporations as well as that of the traditional TVRO manufacturers, distributors and dealers. I hope he is right, but it won't be nearly as much fun!

#### Coop/ continues from page 5

the Scrambling Summit, even on short notice.

#### COUNTER-Counter Measures

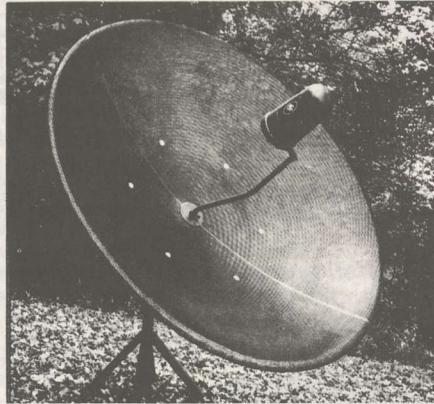
One of our feature reports this month brings you up to date in the **real**, non-hype world of descrambling. We tell it like it is; some will find fault with that since many are claiming 'successes' which we are not convinced are actually there (yet).

It was probably a coincidence. We issued our November Scramble-Fax (newsletter) on the 16th of November. Within a few working days, November 18th, GI had modified a regular operational parameter of their authorization scheme. Here's what happened.

1) We reported that clone chips were in the marketplace. We also reported that a 'master unit' is authorized for various services and then all units with the same ID number will respond to the same authorization (see report in our feature section).

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2) Promptly, again probably a coincidence, GI changed the authorization sequence. Normally, you call up on the telephone with the on-screen ID number and you ask to order one or more services. They tell you to stand by on a specific satellite service and wait for your authorization (turn on) to happen. And they send the turn on authorization.

3) Then, your address is **added** to the data stream and every hour or so, it would cycle and come up **again**. Not anymore; they send you the authorization number for the current month (November being 'Number 18' for example) and after a decent interval (such as an hour) **they cease sending your authorization for the current month**. Then they begin sending you the authorization for the **next month** (December being 'Number 19', for example).

If you turned on with your first data burst or within that first hour, your unit will stay turned on until the 'clock' says it is no longer month 18. When it becomes 0000 hours on December 1st, a new month starts. Now the box has to have an authorization for month 19 (December) and it forgets all about month 18.

Now suppose you had a cloned unit. Your master was present and accounted for, when the initial authorization came down the pike, but the clones dribbled on line for a week, two weeks or more. The clones get their repeat instructions for month 19 (December) but because they were not present and tuned in for the current month (ie. November, 18) **they missed it**. So the clones sit there **not descrambling for all of November**. They start working at 0000 hours on December 1st however

because they were receiving the December turn on instruction for the latter portion of November.

Cute move. A guy who buys a cloned unit is already suspicious. He figures he is a sucker to spend his \$300 and he figures he has been taken. He gets his units and nothing happens. He could, indeed, wait for almost a full month before he saw his service 'pop on'. This counter measure tactic on the part of GI is cute because it makes the clone buyer grieve and agitate over having popped for \$300 (or however much) for a clone that **seems not to work at all**. Not too worry; just schedule a 'party' for the last night of the month and then welcome the new month in with a party similar to a New Year's party. There, on the screen at 0000 hours, everything will work. Blow your horns, make your noise, wear your funny hats. Make a celebration out of it.

This puts a dent in the clone seller operations, to be sure. If he is smart, he'll withhold delivery of cloned units until the last few days of the month. Or, he could deal with a clone service that already has this one figured out. It is possible to do a **double clone inoculation**; the usual U30 thing (again, see feature report) and then with great care a second clone inoculation on **U20**. This starts off with a master unit that has been pre-authorized for its run of paid for services. You are first going in through U30 to change the ID number for the to-be-cloned unit; **then** you are going in through U20 to inoculate the cloned unit with the current month's "password" master key. **This fix is now available**, through the more advanced cloning houses. They smile when they talk about it and refer to it as 'counter-counter

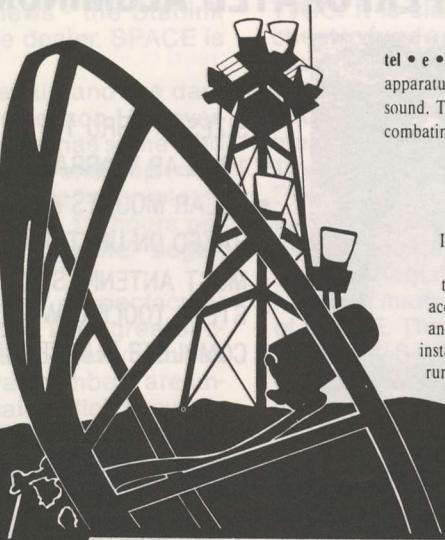
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measures'. Well, GI is reading about it here, first. Let's see what they do to counter the counter-counter measures. This whole thing is like a Zane Grey western novel; it never ends.

Meanwhile, back at the ranch, we have the first (unsubstantiated) reports that GI is testing their technique for identifying clone masters. It is a dumb technique, thinks I. Here is how it is reported to work.

- 1) They take a computer print out of every person out there who has subscribed to **every available service**. This means that anyone foolish enough to buy everything available goes on a 'hit list'.
- 2) Then, they shut the unit down. And they wait for a complaint. When the person calls, they go through an interrogation process, hoping to get a clue from the telephone conversation as to whether that person is **really** an affluent 'nut' who wants everything, or as they hope a 'master unit' for a clone operation.
- 3) If the caller is not convincing, they may then schedule an in-home inspection of the unit. Or suggest you return it to your dealer/the factory for check out.

**Suggestion number one.** If you are a clone master, call **immediately** and raise hell. Being quiet for a couple of days, nervous they have discovered you, is just what they hope you will do. If you do get nervous and clam up with fear, be prepared to act indignant when you **do call** and drop into the conversation how you have been out of town on a trip, came home and found the 'G\_\_\_\_ Damned thing shut off!'

**4)** If they are really concerned about you, and are not

that anxious to get their hands on your suspected

unit, you may have a real problem on your hands.

At least one knowledgeable student of Videocipher **strongly believes** that they can selectively address your unit and 'burn it'. Not set it on fire, but disable it by writing over the supposedly permanent data in U7, the secret memory chip. THEN, without question, you have a unit that will have to go back to the factory (actually, that is not quite true since there are people out there who **have managed** to short the battery on U7, causing it to dump all of its knowledge, and who have then brought U7 back to life. But that is another story, beyond the talents for now of all but a select few Videocipher hackers.)

Let's explore what is really happening here when a guy in Dubuque agrees to become a 'clone master'; that is, the one guy **paying money** for all of those services so 25 other homes can have the same service without paying for it.

What follows is my present-best-logic for why you are **not stealing** from HBO (et al) when you buy a clone unit. There is a special condition that fits my argument-example. It is as follows:

"The master is located inside of the USA. The clones, all of the clones, are outside of the USA." There can be no deviation from this set of circumstances for the following argument to work

**1) John Doe buys a VC2000 in Dubuque.** He subscribes to HBO and all of the rest. He pays \$60 or

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\$70 or whatever per month for all of these services and every scrambled service up there gets one new, paying customer. GI sells one more Videocipher 2000.

- 2) **Meanwhile, down on Antigua** in the Caribbean, a dealer has 25 units which are cloned to John Doe's unit in Dubuque. They, also, receive all of the services. And GI sells 25 more VC2000 units.
- 3) Now, **not one** of the presently scrambled services claims the legal right to sell his service to a VC2000 owner **outside of the USA**. Not Turner, not Disney, not SelecTV. Not anyone. So these 25 units farmed out by the dealer down on Antigua couldn't order up the service, anyhow; legally. The very best they could do is to find their own John Doe 'address' in the states and pretend they were in the states.
- 4) Unfortunately, the clever programming people have decided to verify all of the John Does; harass them by shutting down their service until they are convinced John Doe really is located with his box inside of the USA. So if our 25 John-Does **located down on Antigua** were subscribing to the services **direct**, in short order some (or all) of them would be found out. The boxes are not in Dubuque (or wherever) and they would get turned off. That would also end the cash flow which HBO (et al) was getting for those boxes that were really down on Antigua?
- 5) So who really gets 'ripped off' when John Doe in Dubuque subscribes to everything, pays his monthly or annual fees, and in the process he 'shares' his authorization with 25 'friends' down on Antigua? Do the programmers lose? No, in their verification process they will (they plan) ferret out every non-USA direct subscribing box anyhow, sooner or later. And turn them off.

The programmers don't sell outside of the USA because the programmers don't own the distribution rights to their programs outside of the USA. The programmers therefore cannot, by contract, collect any funds from outside of the USA.

So who loses if John Doe buys a VC2000, has it authorized for everything in the sky, pays bill(s) promptly, and then agrees to allow 25 'friends' on Antigua to 'share' his authorization? Certainly not the programmers. GI actually 'wins' because they sell 25 more VC2000s than they would not have otherwise sold. Certainly not the 25 Antigua 'John Does' because they gain access to programming which they had before scrambling started (also without paying for it, then).

There is one potential 'loser' here; the chap who runs the theater on Antigua will be less apt to book '**Witness**' in his local theater when it becomes available because many of his patrons will have already seen it on HBO back in November of 1986. And that will hurt the people who produced '**Witness**' and distribute '**Witness**' because they will lose the Antigua market for their movie (or they will be forced to sell it for a reduced rate because it already had television exposure in this market, before it qualified for local booking).

I think that is 'where we came in' to this theater. HBO told us way back in 1980 that they were being 'forced to scramble' by the movie producers and distributors because the product (the movies) was getting into the marketplace and cutting into the box office sales. People were watching without paying. Isn't it paradoxical how life is just one, great big, circle???

**ISLAND Project**

Possibly the last thing on my mind when I moved to the Turks and Caicos Islands back in 1980 was the chronic lack of tourists here. In fact, it was because there was a chronic lack of tourists that I even considered moving here. Well, times do change.

Last year Provo had close to 30,000 tourists. Not a lot, but some 20,000 more than the year prior so there is rapid growth. Unfortunately for those who live and work here, virtually all of that growth has come because of the Club Med facility located just 5/8ths of a mile 'up' the beach from our place. I have written, sometimes with tongue in cheek, sometimes not, about this lewd place several times. If you like nude people, loud sounds, lots of sex and an impossible French attitude about anyone not French, you would love Club Med.

**Club Med** was supposed to help our island. Well, it did. Because of Club Med we now have paved roads (well, **some** of the roads are paved, **some** of the time). And we have a brand new, international grade airport with an 8,500 foot modern runway, control tower and a new 10,000 square foot building that is our airport reception, immigration, shops and customs area. We also have a brand new semi-deep water port that allows decent sized freighters in here now. We owe all of this to Club Med.

What we don't owe to Club Med is our island. They have cleverly renamed Providenciales **Turkoise Island** in their literature, and when the Club Med people arrive here they are given pamphlets and instructions welcoming them to 'Turkoise' Island. Every now and again I forget my animosity towards Club Med and strike up a conversation with a full or semi nude who is strolling by our beachfront cabana.

"Do you like it here?" I usually ask. They usually do. "Do you know where you are?" I ask next. They always tell me they are on Turkoise Island, a 'private island owned by Club Med'. When I attempt to explain that this is not the case, they laugh and stumble off dangling in the breeze.

Patti and I make a trip or two each month to the states to operate this magazine business. On a recent trip a young women, obviously a Club Medder, was sobbing. She sobbed from Provo to Miami. A girl friend sitting next to her tried to console her, to no avail. While we were awaiting our luggage, Patti struck up a conversation with the friend. The girl, still sobbing, was off sitting down. Patti learned the girl's father had died. Several days prior. But the girl had learned of the death only that day because her family had been unable to locate a 'Turkoise Island' on any map, or through any telephone operator. Finally, they had gained entry to the girl friend's apartment where by rummaging through papers they had discovered some well hidden reference to Club Med. After they telephoned the Club Med office in New York, they had traced down the girl to our island. Providenciales, not Turkoise Island.

I tell this true story because it illustrates the problem we have down here. More than 25,000 people will come here this year to go to Club Med. They will spend \$1,099 each for a week here and they will have the time of their perverted lives and they will go home not know-

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ing where they really were.

We have other hotels here; from the 70 room Island Princess to the 12 room Third Turtle Inn. They run about 25% full, over the full year and offer everything Club Med does... except for the 'free sex'. We could probably arrange that if we thought it would make a difference.

Last summer Patti and I arranged for a professional tourism promotion group to study our island, and the Turks and Caicos. We wanted to know how we would stack up with Cayman, Jamaica, Barbados, and so on if we had a way to promote ourselves. We came out looking very good. Where we lost was with the tourist agencies who book people to places like this. In our summer study we arranged for a group of tourist agents in Atlanta to sit down in something called a focus group. They were asked about Bermuda, the Bahamas, and finally the Turks and Caicos. They were asked to tell the focus group leader what they knew or believed about the Turks and Caicos. We videotaped the focus group meeting and then analyzed what they had to say. This was an eye opener because these people knew virtually nothing accurate about our islands. One lady swore up and down diving was poor here because we have no reefs. If you dive, you know the reefs are important to diving. Our island is surrounded by a reef and our diving is superb; really first class. Another lady swore up and down you could not fly here; you had to fly to Guatemala and then take a boat here. That would be similar to living in New York, flying to Chicago and taking a boat to get to New Orleans. And on and on. The bottom line was that if these dozen or so tourist agents were representative of the American tourism world, we were not likely to get many tourists through their offices because we have nothing of offer to tourists and you have to spend days getting here via entangled routings.

**Well, I decided to try to do something about all of this.**

First I went to the British government people and asked them to help. They were less than enthusiastic, being more concerned about building roads than building tourism. They were getting good bucks from the Club Med facility and it was 'SRO' (ie. completely sold out) for the full winter season, before the winter's season began. So much for government.

Next I went to the private hotel operators on my island; all five of them. They were anxious that something be done. And we worked out a plan.

Then I went on our local television service and explained my/our plan. We would produce a 30 minute television program each week. We would call it PROVO MAGAZINE and it would be a 'PM' (magazine) type of production. In our 'PM' program we would have four or five or six relatively short features about some unusual aspect of life or recreation or lifestyle on Provo.

The production techniques would be, well, very unusual. We created nine production teams. Each production team consists of between 4 and 10 people. Each production team took a couple of subjects and began outlining their scripts, doing their research, and scheduling their shooting sessions. We now have more than 50 people involved in the production teams, all volunteers and with a few exceptions none have ever worked in television before. They are creating and producing television features for airing on PROVO MAGAZINE

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having selected topics which they think will attract people to visit our island.

We meet weekly. We have bumper stickers on order and 'T' shirts for the production team members. The whole island is abuzz with production team projects; people are doing story boards, writing scripts, researching such things as our rich pirate history, the more than 200 wrecks that lay underwater on our reefs, our hidden caves and our very international community. We preview the 'PM' pieces on our local television service and everyone has an opportunity to critique the pieces before they get into final edited form for actual airing on the 'international version' of PROVO MAGAZINE.

We could have done a straight forward 30 minute program that made us look like every other tourist destination; bright flowers, tanned bodies, brilliant blue and green water, waving palm trees and so on. I chose not to do so since I was convinced that to stand out as a tourist destination, we needed to highlight the things that make PROVO unique and different. And we have hundreds of such things. Like the guy who plays golf on the salt water flats when the tide is out because there is no golf course here. He has a par 9, three hole course laid out in the salt water marsh.

The first edition of PROVO MAGAZINE will air on satellite in December. The people at the **Caribbean Super Station** (CSS on transponder 23 of Westar 5) have promised to carry it. So have a few others after the first of the year. We have an island soap opera in scripting; a 6 to 7 minute segment which will be a regular feature on PROVO MAGAZINE. We call it 'As The Island Turns'. A totally home grown product. We are diving with the treasure divers headed up by famed treasure diver Keith Jessop and watching in fascination as he pumps silver coins and bullion off the ocean floor with a brand new treasure boat he just brought to our islands. He will be here seven years working more than 200 wrecks along our reefs. We are fishing and we are hiking and we are visiting with Americans and Canadians and Frenchmen and others who have moved here to live. We are telling a story, to put our Provo on the map.

Creating PROVO MAGAZINE is pulling the island together. People are talking, working, and creating together. They are exciting one another, and involving one another in a project which benefits us all. The benefits are to those who learn about us in this unique community television project, and to those who live and work here. Nothing that has ever been done here previously has attracted so much interest and has involved so many people.

Patti and I barely had time to play Cribbage before we took on this project. The last thing either of us needed was another 40 hour per week workload on top of what was already a very busy life. But we live here and we have to do what we can with our time and talents to make life here as good as it can be for all who live here. If you happen to work in some serious aspect of television production, we have room in this program for some more professional help. If you can see your way clear to spend a week down here as guests (meaning paid for) of one of the local hotels, in return for helping us train locals in how to produce television feature pieces, I think we should talk. All you have to do up front is promise us that you will go home and talk about the 'Island of Providenciales' and not 'Turkoise Island'.

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